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Noise Element

Of The Tulare County General Plan

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Prepared by the Tulare County Planning Department 1975

The loudest noise ever measured by man occurs at lift-off of a Saturn V rocket. That noise level has been measured at 167 decibels (or an acoustic power level of 195 DB RE 10^{-12} WATT¹). A person exposed to that intense sound level would experience a tremendous pain throughout his body and his hearing would immediately be lost forever.²¹

Larry D. Ikenberry

NOISE ELEMENT

An element of the Tulare County General Plan

Approved: Tulare County Planning Commission
Resolution No. 4345, February 26, 1975

Adopted: Tulare County Board of Supervisors
Resolution No. 75-1675, June 17, 1975

*County planning Tulare co.
city planning Noise abatement*

PREPARED BY TULARE COUNTY PLANNING DEPARTMENT
JULY, 1975

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County of Tulare



PLANNING DEPARTMENT

Telephone (209) 732-5511 - Ext. 341

Room 107, Courthouse

VISALIA, CALIFORNIA 93277

April 29, 1975

Tulare County Board of Supervisors
Courthouse
Visalia, CA 93277

Gentlemen:

The Noise Element of the Tulare County Area General Plan has been prepared in accordance with your requirements and in conjunction with individuals and agencies throughout the County who have expressed an interest in participating in preparation of the Element. We are most appreciative of the assistance given to the Planning Department by the Tulare County Health Department, Environmental Health Unit.

This Element will provide the cities in Tulare County with an adoptable Noise Element of their General Plan, as required (Section 65302 (g) of the Government Code), thus saving them considerable planning monies. Through the Tulare County Association of Governments we have attempted to meet the needs of both the County and the Cities in order to maintain consistency in the policy framework within which we must all operate.

Thank you for your assistance and time spent in working with the Staff in this effort.


Sincerely,

TULARE COUNTY PLANNING DEPARTMENT

A handwritten signature in dark ink, appearing to read "Robert L. Wall".

Robert L. Wall, Planning Director

RLW:KPL:tg



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(TUCYPL - 74-112)

Some of the staff worked specifically on this report; however, all of the staff contributed either directly or indirectly to the preparation of it.

THE TULARE COUNTY PLANNING DEPARTMENT

* Robert L. Wall, Director
Gloria S. McGregor, Assistant Director (1)
Eugene E. Smith, Assistant Director

Advance Planning

Wallace Austin, Division Head
Darrell Hill, Planner III
Rita Bee, Planner II
Richard Huntley, Planning Technician
Donald Dundas, Planning Technician

Graphics

Terrill Ohlwein, Graphics Illustrator (3)
Dan Paulson, Draftsman III
David Moore, Draftsman II (1) (3)
Jose Aguilar, Draftsman II
Maxine Miller, Draftsman II
Robert Rodriguez, Draftsman II
Mike McKee, Junior Clerk (1)
Anita Gonzales, Junior Clerk

Clerical

Esther Walker, Administrative Secretary
Janice Maxwell, Senior Clerk Typist
Theresa Gomez, Intermediate Clerk Steno
Elizabeth Meyers, Intermediate Clerk Typist
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Sharon Saunders, Intermediate Clerk Typist
Madelyne Moreno, Junior Clerk Typist
Margo Bacon, Account Clerk

* Editor
** Project Manager
(1) Resigned
(2) Terminated Internship
(3) Photography

Credits

Current and Area Planning

** King Leonard, Division Head
Greg Collins, Planner II
Greg Dowds, Planner II (1)
Tony Frary, Planning Intern (2)
James Lopez, Planning Intern (2)
Richard Dole, Planning Intern

Ordinance Administration

George Finney, Division Head
Jerry Beatty, Planner III
Fred Hover, Planner III
Henry King, Planner II
Frank Gomez, Planner I
Joe Hickman, Planning Technician
Gene Stover, Planning Technician
Al Marquez, Junior Clerk

Tulare County Association of Governments

Douglas Powell, Planner III

Zoning Inspectors

James Enright
Charles Reed

Tulare County Health Department - Division of Environmental Health

Peter M. Manson, R. S.
Robert E. Brown, R. S.
Anthony R. Maniscalco, R. S.

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OF TULARE COUNTY GENERAL PLAN

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Chapter One

Introduction

CHAPTER I

INTRODUCTION

A. Content & Authority

The State of California under Code Section 65302(g) has required that each county and city prepare as part of their General Plans a Noise Element which is to include in quantitative numerical terms, contours of present and projected noise levels associated with all existing and proposed major transportation elements including the following: (1) highways and freeways; (2) ground rapid transit systems; (3) ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.

The Council on Intergovernmental Relations* has indicated that these noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurrence. The recommended scale is sound level A, as measured with the A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per twenty-four hour period.

The guidelines also indicate that noise contours shall be shown in minimum increments of 5 decibels and shall be continued down to 65 db(A). Hospitals, rest homes, long-term medical/mental facilities, schools, and outdoor recreational areas shall be differentiated and the contours shall be continued down to 45 db(A). They are termed critical facilities in this report. In addition, the element is required to address appropriate site or route selection alternatives or noise impact upon compatible land uses.

The Noise Element includes a general statement of policy indicating the County of Tulare's intentions regarding noise and noise sources in the community, and describes the desired maximum noise levels by land use categories and by standards and criteria for noise emissions from various types of noise generators. In addition, the element acts as a guide to implementation of ordinances and procedures designed to give the County Planning Department, the County Building Department, County Health Department, and the County Engineer, as well as other county departments, the necessary tools with which to work towards solution of noise problems, both existing and future.

Included is a description of the methodology of the preparation of the element,

and a listing of the sources of data that were used to develop the element in order to assist the reader in comprehending the planning process.

This element was designed to identify the noise sources that were most important within the study area. In addition, data on existing and proposed transportation noise sources was presented in such a way as to facilitate the utilization of this element for the location of housing and critical facilities such as hospitals, where noise could interfere with the normal recuperation of patients and the functions of the medical personnel. Since Tulare County is primarily a rural county, this element stresses some aspects of noise generated in the rural areas, in addition to noise more commonly found within the urbanized nodes of the county.

In the development of the element it was apparent that there were actually a number of noise measurement definitions that would have to be used; one derived from the HUD-FHA⁴⁰ criteria which are included in this report, and another from the State of California criteria for highway noise.¹¹ This is also included, since the county would be involved with both sources of data in the implementation of the plan. It was not appropriate, nor possible to consider only one noise notation technique.

It should be noted that the frequency, pitch, duration, and cyclic consistency of noise varies with the individual source. In addition, the individual source of noise is altered in the environment by landscaping, buffering, walls, structures, water bodies, and other familiar features which deflect or absorb noise so that we define it as being "louder" or "quieter" and thereby possibly creating problems that may not be immediately apparent. Through the use of a community survey this element attempts to define and to differentiate among the kinds of noises that are most commonly found in the community, and to note the impact of noise on the individual person. The secondary source of information necessary for the understanding of noise and noise abatement is primarily found within literature more recently produced by the Federal Environmental Protection Agency. Much of this information is readily available to the county and city planning departments, if they wish to use it, and provides a valuable source of scientific data for study of the general problem of noise. (See Bibliography)

*Guidelines for Noise Element -
Appendix D

B. Community Involvement

The Tulare County Agriculture Advisory Committee, and the Environmental Quality Committee, the Tulare County Board of Supervisors, and the Tulare County Association of Governments acted in a review capacity during the process of preparing the Noise Element. The local Chambers of Commerce and interest groups have also been involved during the process of preparing the element. Individuals and organizations that have assisted the Tulare County Planning Department and the Tulare County Association of Governments in preparing the Noise Element are listed in the credits section of the report.

C. Regional Setting

Tulare County lies in the central south San Joaquin Valley with Fresno County to the north and Kern County to the south. Other counties in the Valley have similar agricultural and urban characteristics. Fresno County, with a larger population base, has problems of a greater magnitude than those found in Tulare County; and the sources generated within a larger metropolitan area such as Fresno may take on a complex nature in that they may be more overlapping. This becomes a more difficult and costly problem to resolve than a single point source of noise. Other local jurisdictions surrounding Tulare County were found to have limited ability in the enforcement of noise regulations apparently due to the fact that their staffs and budgets are limited, and noise has not been considered to be a primary concern. This may in part be due to a lack of understanding of the problem itself, but is more likely to be the result of the fact that they are rural in character and the population is widely dispersed. The incremental decisions on a day to day basis that lead to severe noise problems are not yet visualized.

Acknowledgements The San Joaquin County Council of Governments and the Fresno County Council of Governments gave the staff assistance in several cases in the preparation of the element, and the consultant being utilized by the Council of Fresno County Governments - ENVICOM Corp. of Los Angeles - gave the staff periodic advice and ideas that were useful in the preparation of the element. The staff is grateful for their time and efforts.

D. Purpose

The purpose of the Noise Element more specifically, is to:

1. Meet the requirements of the State Law, Government Code, Section 65302(g).
2. Formulate general policy statements responsive to local issues and problems related to community noise.
3. Prepare standards and criteria relating noise levels to the types of land use and environmental factors within the County of Tulare.
4. Set measureable goals for the reduction of noise in specific problems where noise is deemed to be a critical problem. These goals should be supported by an action program that leads to the resolution of noise problems.
5. Relate the Noise Element to other elements of the Tulare County General Plan and the Environmental Resources Management Element programs.
6. Relate the Noise Element to Environmental Impact questions such as how noise is a factor in social disruption, causing physical and psychological damage to human beings and which may even contribute to depression of the County's economy.

The Element suggests implementation techniques, i.e., procedures and tools that can be utilized to meet the goals and objectives of the Noise Element. These include noise ordinances and regulations, maintenance of liaison with transportation agencies and input to the transportation plan being prepared by the Tulare County Association of Governments. Revision of other elements of the General Plan to reflect the findings of the Noise Element will eventually be necessary and revision of the building code³⁷ to reduce noise transmission from within buildings is gradually being required by such agencies as the California State Commission of Housing and Community Development under authority vested in them by the Health and Safety Code. In addition, the Element should provide policy guidelines for the County Health Department and other agencies within the County.

In addition, implementation should include requirements for construction of sound attenuation devices where critical facilities are located close to noise generators. It should include correction of noise problems around intolerant areas (critical facilities) such as schools and parks, hospitals, rest homes, as required by State law.

E. Limitations of the Element

This Element is not designed to answer questions regarding specific noise sources beyond the jurisdiction of local government. Rather, it should be the responsibility of local government to provide individuals with an indication as to what agency is actually responsible for solving specific problems.

This Element does not indicate special areas of concern within cities except in a general way. It remains for each city to specify how they wish to solve noise problems and to what degree they can allocate time and money to problems associated with noise. In the overall context of community concerns, noise may rank high or low depending upon severity of the problem, methods used to analyze community needs, the degree of interest in the subject by the staff, possibilities for solving the problem at the local level, and cost to the persons involved. This document is advisory in nature then, to the cities, and when adopted by the Board of Supervisors it will become part of the Tulare County General Plan.

It should also be understood that a minimum of actual field work was undertaken as part of this study. Scientific monitoring of noise levels in and around communities will need to be accomplished within the next few years in order to respond to Federal and State requirements; locate new critical facilities; and develop a baseline of information upon which to address future questions concerning noise.

The County does not maintain calibrated equipment for field work, since no department has been authorized to undertake a long range commitment for developing baseline data, similar to weather, air pollution, groundwater and traffic count information. Without some minimum commitment to gathering of consistently sound scientific information, noise levels in and around communities will continue to be a source of debate rather than a body of knowledge to be understood and acted upon.

Finally, the Noise Element, like a Seismic Safety Element, Land Use Element, or other element, should be a positive device for supporting county or city policies. By itself, the Noise Element cannot be an effective piece of county or city policy for maintaining liveable communities unless connected with the other plan elements. The Noise Element then, should be considered as only one aspect of a well-rounded

county or city planning program that eventually ends in effective environmental and community ordinances/policies/philosophy, that is based upon the needs and desires of the individual, the community, and their ability to make commitments to solutions that have a high degree of probability for success in meeting those goals and aspirations.

F. Steps Required for Adoption of Element

Here is a check list of thoughts and suggestions for cities to use in preparing for adoption of the Noise Element of the General Plan for Tulare County and its Cities. The list is not all-inclusive and does not constitute a recommendation in and by itself. Only the City Council of each city has the authority to decide if they wish to adopt the Element either by reference, with modifications, or to utilize some of the work contained herein to prepare their own Noise Element. Certainly the Element should be addressed by each City Council and alternatives for action should be decided upon.

1. *The County Planning Department on behalf of the Tulare County Association of Governments and the Tulare County Board of Supervisors will assist any city wishing help with the adoption of their Noise Element. The first step then is for the city staff to contact the Tulare County Planning Department.*

2. *The implications of the Element are contained within the State Guidelines for preparation of a Noise Element, as prepared by the California Council on Intergovernmental Relations in the report titled "General Plan Guidelines - Sept. 1973." The second step then is to review the Element in light of these Guidelines and the feedback received from the City Council, Planning Commission, citizen groups, etc. Public hearings and review are required by law.*

3. *The third step is to make a determination as to whether or not the city wishes to prepare an Environmental Impact Report on the Element or file a Negative Declaration.*

4. *Fourth, they should add or delete policies as necessary. If appropriate, the city staff could add an addendum to this County Element. The data and information necessary to do this is, in large part, available from the County Planning Department staff.*

5. The fifth action is to prepare a resolution adopting the Noise Element by reference. A model is contained in the Seismic Safety Element, Part II.

6. Sixth, a copy of the resolution of adoption should be sent to the California Council on Intergovernmental Relations and the Tulare County Association of Governments.

G. Relationship to Other Comprehensive Plan Elements

The relationship of the Noise Element to other comprehensive plan elements, either completed or in progress is depicted in the following table.

The findings of the Noise Element should be reviewed in light of completed and on-going plans to insure that recommendations contained in the Noise Element are considered.

Also, the Water & Liquid Waste Management Element, adopted by the County and cities, contains sufficient detail for the smaller communities to constitute a local General Plan. In this respect the relationship of the Noise Element to the Water & Liquid Waste Management Element may actually be greater for smaller communities in the County.

The Airport Master Plan¹ has been further detailed with adoption of Airport/Air-space Zones in and surrounding the three major airports in Tulare County. In this respect the County Airport Master Plan is a basis for implementation of the Noise Element. Land use and airspace controls for airport zones were adopted by Tulare County in 1974 and it is anticipated that the entire Element will be updated in the near future.

The Circulation Element will reflect the recommendations contained in the Regional Transportation Plan (RTP) due to be completed in March, 1975. The RTP is being prepared by Quad Consultants for the Tulare County Association of Governments and the State of California. Updated Land Use and Housing Elements will also be designed to reflect Noise Element recommendations as they relate to the Circulation and Transportation studies since land use patterns are largely determined by transportation routes and modes. Where substantial critical facilities exist near circulation routes then the upgrading or modification of the circulation route should be undertaken in order to protect the facility relative to noise problems.

CHART 1
RELATIONSHIP OF NOISE ELEMENT TO TULARE COUNTY GENERAL PLAN

DATE	RELATIVE IMPACT	PLAN ELEMENT
1970	x	Airport Master Plan (N)
1974	x	Circulation Element (amended) (M)
1974	x	Land Use Element (amended) (M)
1974	*	Biological Resources Element (N)
1974	o	Soils Element (N)
1972	*	Corridor Concepts (N)
1974	o	Seismic Element (Parts I & II) (M)
1974	o	Safety Element (M)
1974	o	Animal Waste Element (N)
1974	x	Housing Element (amended) (M)
1972	o	Flood Plain Management Element (N)**
1972	o	Water & Liquid Waste Management Element (N)
1963	*	Land Use Element (M)
1974	*	Urban Boundaries Element (N)
1972	*	Environmental Resources Management Element: includes Open Space (M) & Recreation (N)
1975 (due in March)	*	Regional Transportation Plan (N) TCOG in progress

x = Closely relates to Noise Element
 * = Relates somewhat to Noise Element
 o = Minor or no relationship to Noise Element
 ** = Flood Plain Management and Regional Transportation Plans
 are not mandatory by State Planning Law but are required
 by other State and Federal legislation
 N = Non mandatory
 M = Mandatory

FINAL ADOPTED POLICIES
NOISE ELEMENT OF THE TULARE COUNTY AREA GENERAL PLAN

POLICY NO.	PAGE NO. REFERENCE	RECOMMENDATIONS IN REPORT (SYNTHESIZED IN POLICY SUMMARY FORM)
1		THE ADOPTED POLICIES OF THE NOISE ELEMENT OF THE TULARE COUNTY AREA GENERAL PLAN ARE AS FOLLOWS:
2		ONLY THESE POLICIES ARE TO BE CONSTRUED AS OFFICIAL POLICY OF THE TULARE COUNTY BOARD OF SUPERVISORS.
3	3	<i>The County recommends that cities within the County adopt this Noise Element with modifications to fit their individual and special needs.</i>
4	4	<i>The County will update other plan elements to reflect policies of the Noise Element.</i>
5	Chapter 2	<i>Tulare County recognizes the risk to human health from noise and it is the policy of Tulare County to resolve these risks where possible and attempt to reduce them where responsibility for doing so lies with County government.</i>
6	21	<i>Tulare County hereby adopts the goals for working toward a quieter environment as indicated in this document.</i>
7	24 and 50	<i>It is the policy of Tulare County to give priority to a monitoring system that recognizes critical facilities and high level noise generating sources as defined in this Element. Specifically these are contained on the map titled Noise and Critical Facilities.</i>
8	37 and 55, 56	<i>It is the objective of Tulare County, through the land use planning process and EIR process, to mitigate noise.</i>
9	50	<i>The County will consider noise when updating the Airport Master Plan.</i>
10	50	<i>Noise shall be a consideration in planning for airports in Tulare County and their environs. It is the policy of Tulare County to enforce federal and state regulations related to land use planning around such facilities as required.</i>
11	50	<i>The County Executive Officer in conjunction with the Board of Supervisors shall direct other county departments to cooperate with County Health Officer in the development of accurate and scientific data to deal with noise problems.</i>
12	50	<i>When economically feasible support shall be given to the Public Works Department when new technologies are available to reduce noise in such areas as highway pavement design and highway planning.</i>
13	53	<i>It is the policy of Tulare County to support the use and purchase of equipment that is designed to monitor noise in order to reduce noise. Equipment should be purchased on a cost benefit basis with recognition of non-quantifiable benefits.</i>
14	54	<i>The County shall support the concept of reduction in mobile noise sources through design innovations and recommend techniques that are technologically and economically feasible to other levels of government.</i>

POLICY NO.	PAGE NO. REFERENCE	
15	56	<i>It is the policy of Tulare County to utilize open space where possible for reduction of noise impact on specific land uses, and particularly those facilities and uses that are called out as "critical" within this Element.</i>
16	56	<i>Noise will be considered in the environmental assessment process as required by State law.</i>
17	57, 58, 59	<i>The County will work toward the reduction of noise in buildings. Noise as a factor in design of structures will be considered by the building inspector when new structures may have potential noise problems either within the structure or as a result of being located near noise sources.</i>
18	62	<i>It is the policy of Tulare County to update building and health codes to reflect consideration of excessive noise as deemed appropriate by the Building Department and the Health Department respectively.</i>
19	62	<i>In conjunction with the Building Department, Planning Department and Public Works Department and the cities within Tulare County, monitoring of noise and data collection programs for update of the Noise Element shall be undertaken. The Noise Element shall be used as guidelines for the development of a monitoring program by the Tulare County Health Department.</i>
20	62	<i>The County of Tulare supports the concept of user/benefit. It is the policy of the County of Tulare to require that persons creating new noise sources be the ones to abate the noise.</i>
21	63	<i>The Planning Department shall review and update the Noise Element periodically as required by State law.</i>
22	63	<i>The Planning Department shall work with state and other levels of government to better define local responsibility and requirements in regard to noise.</i>
23	Appendix B	<i>The County of Tulare may utilize the League of California cities or other Model Noise Ordinances for guidelines for use by both the County and cities. This model ordinance should be reviewed by the County Health Officer for adequacy and modified to meet requirements of Tulare County in the abatement of noise and elimination of noise pollution in the environment.</i>

Chapter Two

The Noise Pollution Problem

CHAPTER II

THE NOISE POLLUTION PROBLEM

A. What is Noise and Vibration

A person's acoustical environment consists of the sound that he hears at any particular instant of time. The sound may be pleasant and desirable, or it may be discordant and unwanted. In the latter case the sound is called "noise."

Sound can be defined as a rapid, small-scale fluctuation of the instantaneous air pressure above and below the local barometric pressure, usually following a repetitive pattern.

The generation and propagation of sound is easily illustrated by a simple model. Consider a plate suspended in air bounded on both sides by layers of air. If we strike the plate it vibrates, moving rapidly back and forth. As it moves, it compresses the air in the direction of its motion and when it reverses direction, it leaves a partial vacuum or rarefaction of the air. These alternate compressions and rarefactions cause small fluctuations in atmospheric pressure which are repeated in subsequent layers of air extending outward from the plate. When the pressure variations strike the ear drum, it vibrates in response to the changes in pressure. The disturbance is carried through the inner ear to the brain where it is interpreted as sound. (See Figure 1)

FIGURE 1

Propagation of Sound Waves

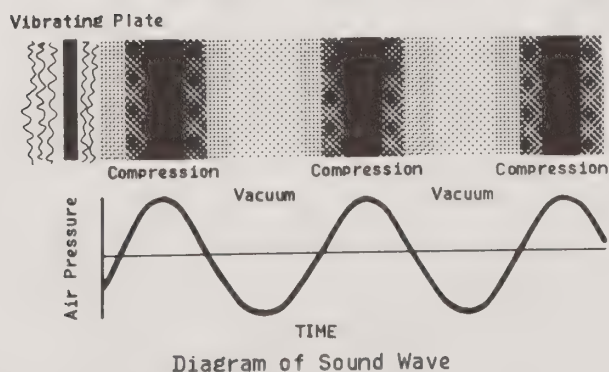


Diagram of Sound Wave

B. Defining the Characteristics of Sound

Intensity

The pressure variations producing sound are so small that they are measured in "microbars." (A microbar is about one-millionth of normal atmospheric pressure which is 14.7 lbs. per sq. in.) The human ear is so sensitive that it can detect sound pressure variations as low as .0002 microbar, while at 200 microbars,

a one million-fold increase, discomfort is produced. This is far too great a range to express conveniently in a normal arithmetic scale, so it is necessary to express noise intensity in another term - the decibel (db).

The decibel is simply the logarithm of the ratio between a particular sound pressure and the lowest detectible pressure, .0002 microbar. Thus, .0002 microbar becomes 0 db and 200 microbars equals 120 db sound pressure level (SPL) according to the formula:

$$SPL = 20 \log_{10} \frac{P}{P_0} \text{ dB}$$

where P is the measured sound pressure and P_0 is .0002 microbars.

On the decibel scale, a 10-fold increase in sound pressure results in a 20 db increase in the meter reading, a 100-fold increase in sound pressure produces a 40 db increase, and so on.

The decibel is also used as a measure of the power produced by a sound source. Here the decibel is the logarithm of the ratio between the acoustic power, in watts, and a reference power of 10^{-12} watts.

Sound power level (PWL) is expressed by the formula:

$$PWL = 10 \log_{10} \frac{W}{W_0} \text{ dB,}$$

where W is the acoustic power in watts and W_0 is 10^{-12} watt. A 10-fold increase in sound power is equivalent to 10db, a 100-fold increase equals 20db, and so on.

If you double the sound power, you only add 3 db to the sound pressure level. That is, if you have one source which produces a sound pressure level of 90 db, and add to it another identical source with a 90 db level, the total sound pressure level is 93 db, not 180 db.

Sound levels diminish as you move farther away from the source. Every time the distance from the source doubles, the sound pressure level goes down 6 db.

Frequency

Another aspect of sound is frequency of pitch, which is the number of times the air pressure variations occur in a second. Frequency is expressed as cycles per second (cps) or Hertz (Hz) which means the same thing.

Low frequency sounds are those with few variations per second, such as notes from a tuba, while high frequency sounds have many variations per second, such as the sound of a piccolo.

Some examples of sound frequencies from the piano keyboard are:

Note	Fundamental Frequency
C ₃	131 cps)
Middle C	262 cps) Each interval
C ₅	524 cps) is one octave
C ₆	1048 cps)

Most sounds contain more than one frequency. Sound which contains a wide range of random frequencies is called "broad band" noise. Sound that contains only one frequency, such as a shrill whistle, is called a "pure tone." Pure tone noise can be especially annoying.

The human ear can hear frequencies from about 20 to 20,000 cycles per second (cps). But it cannot hear all pitches equally well, being more sensitive in the range of 3000 to 4000 cps than in either lower or higher frequencies. Thus, a 4000 cps tone of 60 db sounds just as loud as a 100 cps tone of about 75 db and a 4000 cps tone at 60 db sounds much louder than the 100 cps tone at 60 db.

C. "A" Weighted Sound Level

One of the most important reasons for wanting a frequency analysis of a noise is that people not only distinguish the high-frequency from the low-frequency components in noise, but they find high-frequency noises much more annoying than low-frequency noises of the same intensity. Therefore, to evaluate how disturbing each noise will be, we should know how much of the total sound energy is contained in each of the bands of frequency. This could be a complicated task, but by using a special weighting scale in the sound level meter, the frequency response of the average human ear can be simulated. The "A" weighted scale covers a frequency range of 400 to 12,000 Hz; like the ear, it is more sensitive to the higher, rather than the lower frequencies. This measurement is expressed in decibels and abbreviated db(A) which allows for a scientific notation when monitoring noise.

D. Physical and Psychological Effects of Noise

Anatomy and physiology of hearing

In order to gain insight into the effects of noise on man's hearing, it is important to develop a basic understanding of the anatomy and physiology of the human ear. Figure 2 is a diagram of the human ear.

Wave motions in the air set up sympathetic vibrations which are transmitted by the eardrum and the three bones of the middle ear to the fluid-filled chamber of the inner ear. In the process, the relatively large but feeble air-induced vibrations of the eardrum are converted to much smaller but more powerful mechanical vibrations by the three ossicles of the middle ear, and finally to even stronger fluid vibrations in the cochlea of the inner ear.

Within the cochlea are microscopic hair cells that move back and forth in response to the sound waves just as seaweed on the ocean floor undulates in response to wave action in the ocean. It is the energy impulses created by the movement of these hair cells that go to the brain where they are interpreted as sound. But just as the seaweed can be torn and ripped by violent wave action in the ocean, the delicate hair cells can be damaged by intense sound waves.

Physiological Effects of Noise

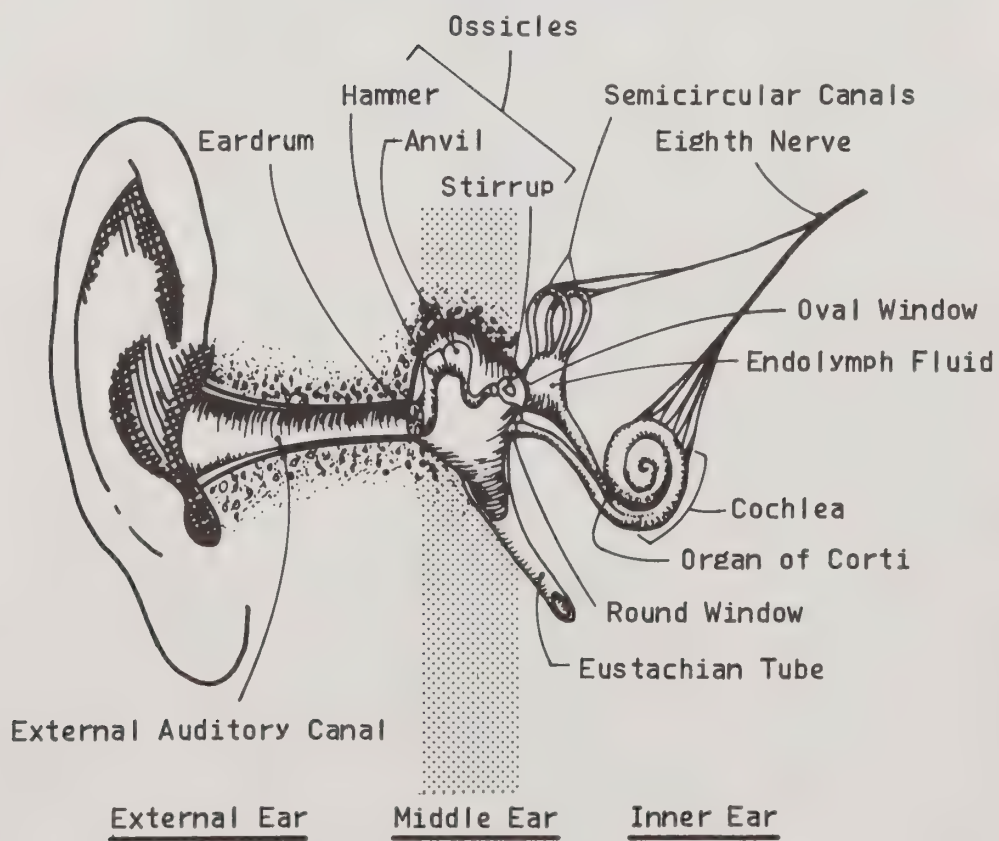
Sudden, unexpected bursts of noise will produce measurable physiological stress reactions, including changes in blood vessel diameter, cardiovascular blood pressure and volume, heart rate, respiration rate, pupil size, sweat gland activity, endocrine gland excretions and other neural and body activities. These responses are sometimes designated as "arousal" or "stress" reactions, and are difficult to distinguish physiologically from responses which occur in functional states such as fear or anger.¹³

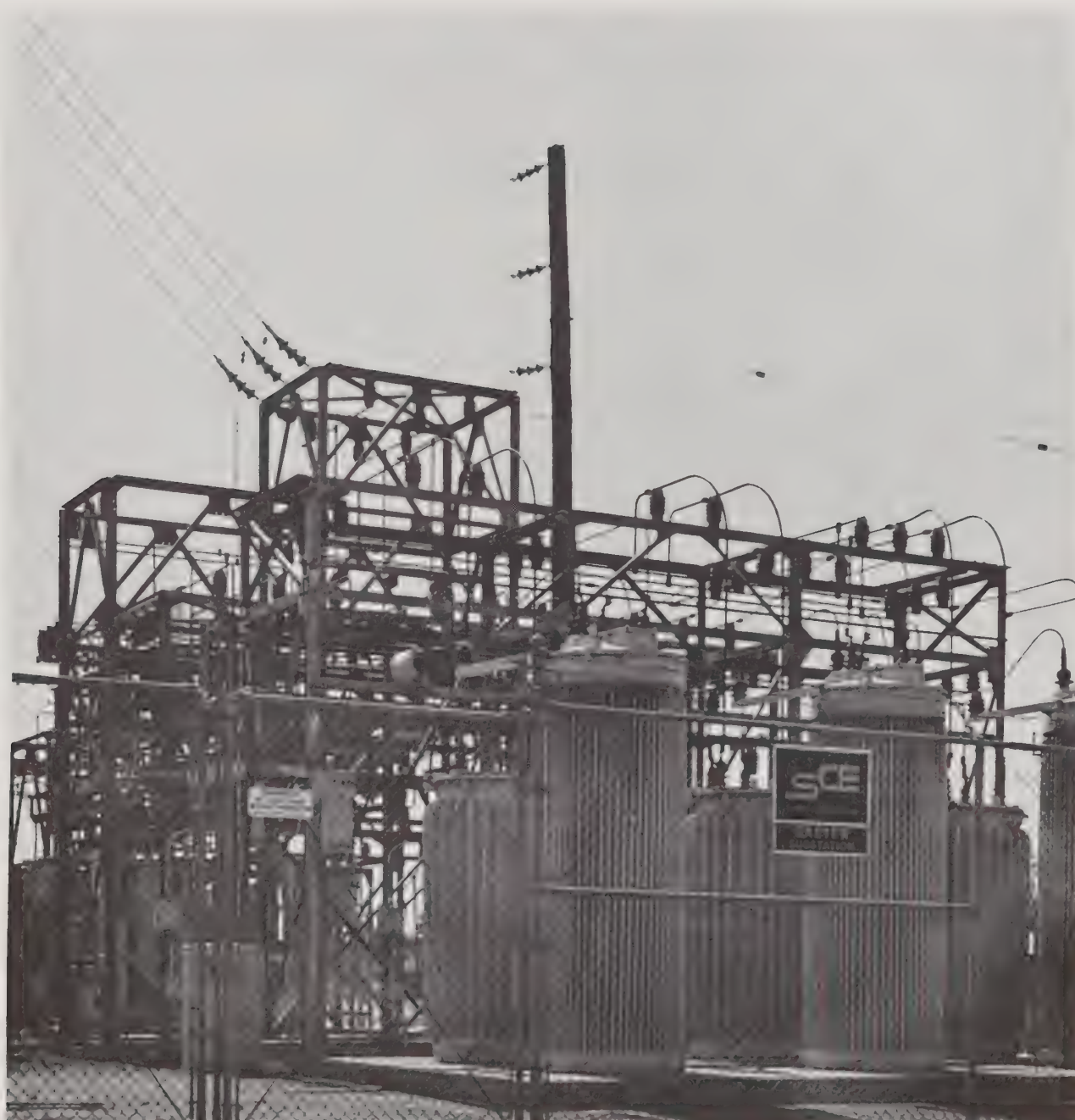
Chronic overstimulation of the arousal response could result in cardiovascular disease, hypertension, equilibrium disturbance, increased susceptibility to disease and increased rate of birth defects.²⁴⁻³⁻³²

The level of noise required to produce physiological effects varies, but the threshold of stress response is at about 65 db(A) and becomes pronounced at 80 to 85 db(A).²⁴

Noise Induced Hearing Loss.

Exposure to sound levels of 75-85 db(A) can cause a temporary threshold shift in hearing, with normal hearing acuity returning gradually after the noise ceases. For example, exposure to 85 db(A) sound levels, continuously, for one hour can produce a 10 db(A) temporary hearing loss; while 75 db(A) for 3 hours and 20 minutes can produce a similar 10 db(A) loss. If the conditions leading to temporary loss are repeated frequently enough over a period of years, some degree of permanent loss could result.³²

DIAGRAM OF HUMAN EAR



Another sight commonly found throughout the County is power distribution facilities. The County is served by both Southern California Edison and Pacific Gas and Electric Company. Noise and the accompanying safety hazards associated with these facilities are governed by

the Public Utilities Commission. The role of the County, and the cities within the County, is primarily to note the fact that these facilities do generate noise periodically and land uses should be carefully located adjacent to them so as not to create community concern.

FIGURE 3
IMPACT OF NOISE ON PEOPLE

The higher the noise level, the shorter the period of time required to produce both temporary and permanent hearing loss. The legally established federal maximum allowable unprotected noise levels for occupational exposures are as follows:²⁰

Occupational Noise Exposure Limits

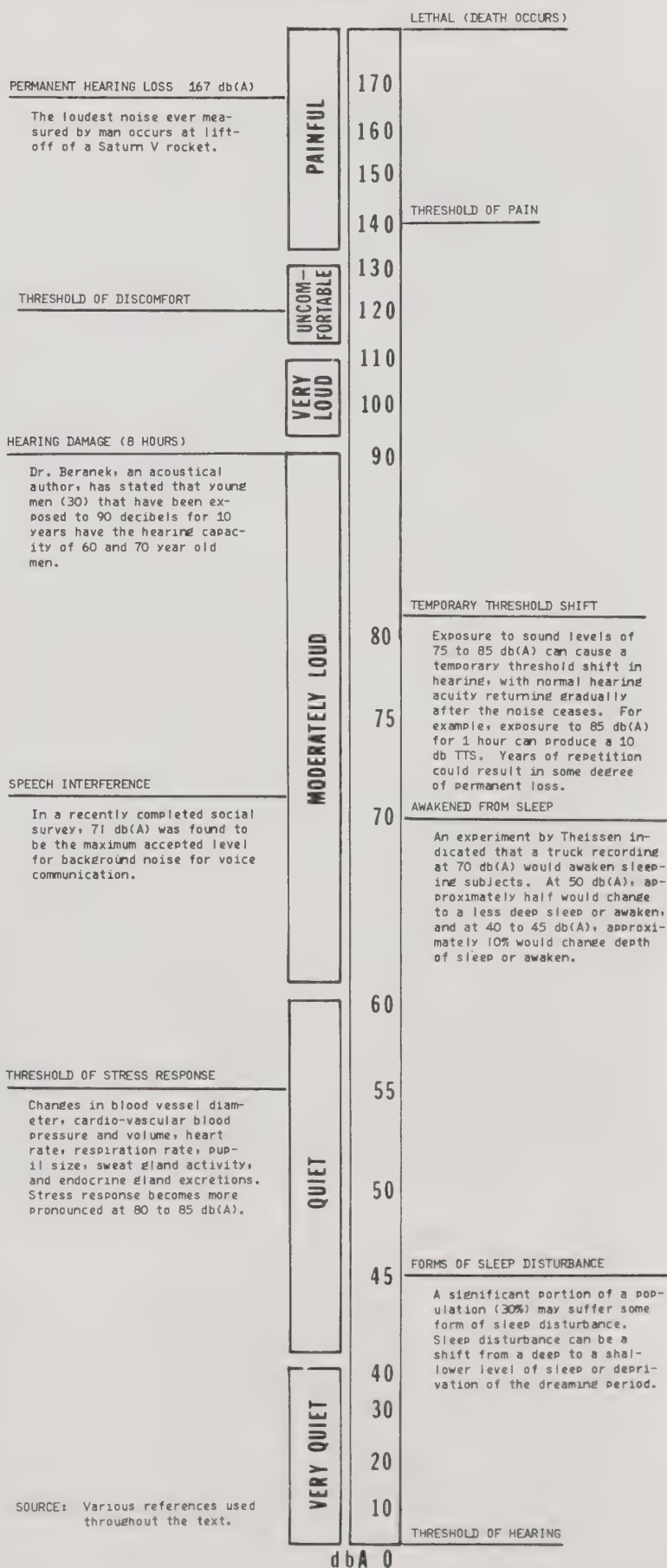
Duration per Day Hours	Sound Level db(A)
8	90
4	95
2	100
1	105
1/4 or less	115

A recent 10-year survey showed that 30 percent of the workers exposed to noise levels within the federal limits experienced significant hearing loss.³⁵ Some interesting comparisons have been made regarding the natural hearing loss due to the aging process between the people of industrialized nations and those living in primitive areas. In a study made by Dr. Samuel Rosen of the Mabaans, a primitive African tribe, it was noted that the hearing of these people who live in quiet, peaceful surroundings was very sensitive, even in old age. It was also noted in his study that if a Mabaan moves to an industrialized city his hearing gradually deteriorates at the rate that is normally attributed to old age.¹⁵ It may well be that the modern, noisy, mechanized environment in which many of us live affects our hearing in ways that we are not even yet aware of.

Psychological Effects of Noise

The psychological effects of exposure to noise have been the subject of much discussion and controversy. The manner in which an individual reacts to a particular noise exposure is influenced by a number of factors. Some of these factors are relatively easy to measure and some others are extremely difficult to measure. An individual's responses to noise will be influenced by the intensity, frequency, composition, duration, interval of occurrence, and time of occurrence of the noise. Their responses will also be influenced by subjective reaction to the noise. A sound that is unwanted and undesirable, (therefore "noise") to one person may not be "noise" to another.

Generally speaking, noise can interfere with sleep, relaxation, recreation activities, communication with others, and concentration. This type of interference is thought by many authorities to adversely affect the mental health of the person exposed to the noise. (Figure 3)



The State of California Department of Public Health, citing several case studies and attitude surveys of human reaction to noise, compiled the following tables showing community annoyance indices for residential areas:

TABLE I

What People Want

<u>Location</u>	<u>Noise Level db(A)</u>	
	<u>Day</u>	<u>Night</u>
Rural Residential	35	25
Suburban Residential	40	30
Urban Residential	45	35

TABLE II

What People Will Accept Without Undue Complaint

<u>Location</u>	<u>Noise Level, db(A)</u>	
	<u>Day</u>	<u>Night</u>
Rural Residential	35-45	25-35
Suburban Residential	40-50	30-40
Urban Residential	45-55	35-45

TABLE III

Estimated Community Response to Noise

<u>Noise Level in db(A)</u> <u>Above the Acceptable Level</u>	<u>Estimated</u> <u>Community Response</u>
0	No observed re- actions
5	Sporadic complaints
10	Widespread com- plaints
15	Threats of Action
20	Vigorous Action

The physiological and psychological effects of sleep interference have been well documented. Acute loss of sleep may impair performance of certain kinds of tasks. Jobs that require short-term memory and high-speed processing of information are extremely sensitive to small amounts of sleep deprivation. Chronic loss of sleep can cause psychological distress. Severe sleep disturbance precedes and accompanies most psychiatric syndroms, and complaints of sleeplessness are among the most frequent symptoms presented to the general medical practitioner. Another aspect of the psychological effects of noise on man is the distortion of esthetic appreciation for the environment

in which he lives. Constant exposure to an environment that is cluttered with frequent interruptions by unpleasant levels of noise conditions the individual to become insensitive to his environment. This insensitivity to the environment can have serious implications in an age when the environment is coming under increasing strain from man's activities.

E. Effects of Noise on the Natural Environment

It has already been established that high levels of noise can substantially degrade the environment in which man lives by subjecting him to factors which adversely affect his physical and mental health. These adverse factors can also affect living communities of the environment exclusive of man.

All living organisms respond to stimuli they receive from the environment. Man is able to control his environment to some extent in order to reduce environmental factors that affect him adversely. Other living organisms do not have this kind of influence on their environment. High levels of environmental noise are thought to affect the natural communities of the environment by changing the species composition, density and distribution of the population affected.

F. Economic Impact of Noise

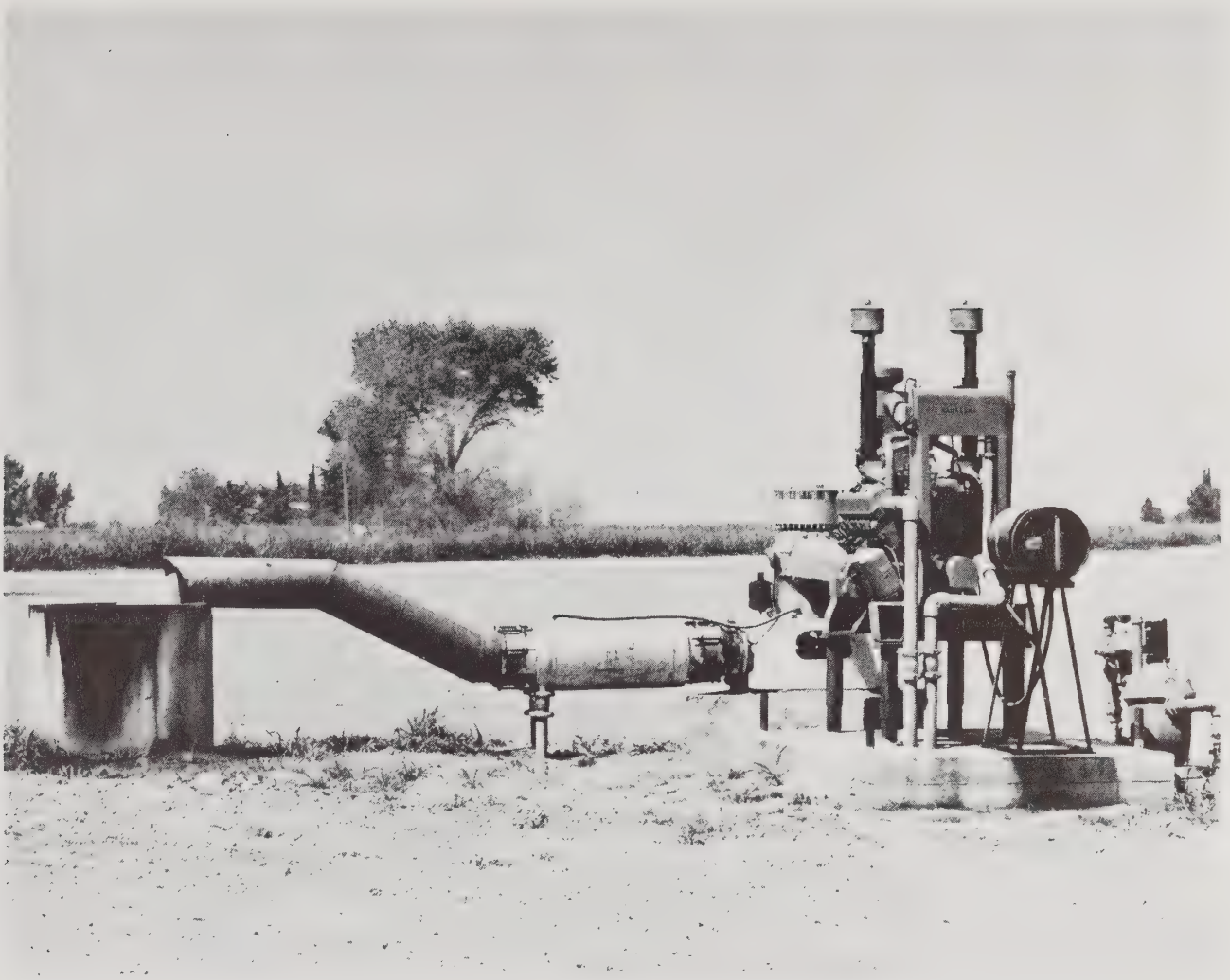
Community noise not only degrades the quality of the environment in which man lives but also affects his productivity. It has been previously mentioned that noise interferes with sleep, communication, concentration, and may create tension among individuals exposed. All of these factors influence the efficiency in which a person performs certain tasks. Therefore, the greater the loss of efficiency the greater the impact on the economy. Studies have indicated that certain activities are especially affected by noise. Concentration in the office, industrial plant or schools is imperative if a person is to perform his duties efficiently and safely.

Agricultural operations are also affected adversely by high levels of noise. Livestock experiences the same kind of physical and psychological stress that man experiences when exposed to high levels of noise. Physical and psychological stress impairs the health of the livestock and therefore reduces their productive source.



High speed motorboats have become the cause of several deaths in recent years in Tulare County. Discussions between Fresno County and Tulare County officials regarding safety

provisions on the Kings River may be partially instrumental in reducing noise levels and providing a greater level of safety.



An engine powered water pump in an agricultural area - a common and necessary sight in Tulare County; but the continual noise associated with this kind of machinery is disturbing to residential and critical land uses such

as rest homes, parks, and schools. Separation of dwellings from these machines is recommended in this plan. It also proposes to avoid these problems through insulation of such equipment or abatement at the path of the noise.

G. Unique Noise Problems of Rural and Mountain Areas

Tulare County is largely composed of rural areas, and many of its residents have enjoyed a relatively quiet and serene environment most of their lives. The population of Tulare County has been substantially increasing in recent years as many persons have been leaving the noise and frustration of highly urbanized areas to make their homes in rural areas such as Tulare County. Consequently, areas that were once quiet and serene, are now becoming relatively busy. Also, manufacturing processes, transportation facilities, and agricultural equipment

have become larger and consequently noisier. It will be increasingly difficult to maintain community noise at acceptable levels as the County increases in population and as more industry moves into the area, causing an increase in housing, traffic and all related services. Tulare County is largely made up of citizens who prefer a rural environment and the County has a responsibility to preserve that setting. In addition, many people come to Tulare County for recreation in forest and park lands. The unique and serene environments can only be mentioned in this report in passing. The economy of Tulare County is partly based upon the unique natural areas that give the County its reputation as a tourist center.

Chapter Three

Community Noise Survey

CHAPTER III

COMMUNITY NOISE SURVEY

A. Introduction

The problem of noise within our society has been recognized by industrialists and industrial unions for many years; however, there have been few attempts to monitor, regulate, or plan for the abatement of noise at the community level. Within the last 25 years the increase of noise within the United States has been tremendous, with an average increase of one decibel per year since 1949.⁴ Noise within Tulare County causes numerous problems which are unique to a region which bases its economy upon agrarian ventures. At the same time, the cities within the County are expanding and noise associated with urban and recreational uses is creating problems normally associated by most people with larger urban areas.

A Community Noise Survey was initiated by the Tulare County Planning Department. It has proven to be useful in identifying the various forms of noise being generated within the County and the urban areas. The Noise Survey is part of the ongoing community wide effort by the County to assess citizen needs and consequently to address those needs with appropriate action.

B. Survey Methodology

The survey essentially excludes the mountainous portions of the County due to limited newspaper coverage in these areas.

The survey was published in ten local newspapers in the County which have a total circulation of approximately 40,400*. The survey was taken on prime days and information was aggregated for use by cities and other County departments in urbanized and unincorporated areas.

C. Survey Results

The Community Noise Survey was developed in a manner which would solicit a good response from the citizens within the County. The questionnaire requested residents of the community to respond to questions which would enable the Planning Department to more accurately analyze local needs for a Noise Element and concerns of residents regarding noise pollution in Tulare County.

* Figures taken from Ayer Directory of Publications - 1973

Location of Respondent

Of the 284 questionnaires returned, 89% were from persons residing in the eight incorporated cities in the County. In view of the fact that only 63% of the population lives in these eight communities, the survey is heavily biased towards representing the opinions of persons living in these areas. The percentage breakdown of responses for each of the communities is shown in Table I.

TABLE I
SURVEY RESPONSE RESULTS

Area Surveyed	No. of Responses	% of Total
Tulare	85	30.0%
Visalia	75	26.3%
Porterville	38	13.4%
Dinuba	18	6.3%
Lindsay	14	4.9%
Exeter	13	4.6%
Woodlake	10	3.5%
Three Rivers	8	2.8%
Terra Bella	7	2.5%
Ivanhoe	3	1.0%
Springville	3	1.0%
Camp Nelson	2	0.7%
Tipton	2	0.7%
Pixley	2	0.7%
Orosi	1	0.4%
Strathmore	1	0.4%
Earlimart	1	0.4%
Alpaugh	1	0.4%
Total	284	100.0%

An unusually high percentage of survey responses were received from Tulare and Visalia, (56.3% of the total survey population). Even when allowing for a sizeable percentage of error, it is probable that noise sources are more likely to be noticed in the higher density urban areas where the intensity of land use is greater than in the rural areas.

The rural areas are not less apt to be "noisy" - on the contrary, they may be very noisy during certain periods of the year when harvesting and other farm activity is at its highest. Since the survey was taken in April when farming activity was light, it is not surprising to find that few people commented on noise generated in agricultural areas; also, the agricultural noises are generally periodic and it is unlikely that people in agricultural areas would be apt to complain about noises that are part of their economic mainstay or that they know will be temporary.

In addition, the "second home" population and large numbers of tourists visiting the County periodically were not surveyed. One of the most typical kinds of complaints about noise is related to camping and vacation sites where silence and solitude are sought for their own value. Barking dogs, motor vehicles, power saws, guns and other noise sources may be a great annoyance and may cause people to select another vacation place the following year, but these kinds of concerns are unlikely to be of significance to the County as a whole. They are more typical of almost any rural or mountain vacation area.

More recently, the Board of Supervisors has had to pass an ordinance to prevent the use of bullhorns and loud speakers at public events when they are found to be annoying.* This kind of ordinance has been considered by other communities where racial disturbances and labor strikes were prominent. The survey did not show any evidence of concern for this particular problem even though the media has given wide coverage to labor and racial problems during the last two years.

Use of the Survey.

The results of the survey are useful in determining the effects of noise pollution upon the residents of Tulare County and will in turn, be used as partial basis for development of goals and policies for the Noise Element. With comprehensive data indicating the sources of noise which are of most concern to the residents of Tulare County, the noise study and recommendations will be based upon primary research as well as other secondary material available from federal, state and other sources.

The survey questionnaire itself was comprised of ten questions and an area within which to make comments. The results of the questionnaire indicate that there are common generators of noise within the urban areas which are listed more frequently for the cities than they are for those responding in the rural areas. Conversely, those noise sources which are related to agricultural uses are more frequently noted as annoying within the rural areas than they are within the urban communities.

Some of the questionnaires were returned with certain specific questions answered. The response to each question was, therefore, computed individually by percentage, based on the total number of responses to the particular question.

Many of the questions, also, allowed more than one choice, therefore, those questions were computed by percentage, based on the total number of possible responses.

1. Neighborhood Noise

The majority of those surveyed (48%) felt that their neighborhood was "sometimes noisy." The next largest response indicated that many people (31%) found their neighborhood to be, "usually noisy." Although many of the respondents did feel that their neighborhoods were noisy at one time or another, only 11% felt that their neighborhoods were "always noisy." Conversely, 10% of those who responded to this question felt that their neighborhood was quiet. A breakdown of the results are shown in Table II.

TABLE II
NEIGHBORHOOD NOISE

Frequency	No. of Responses	% of Total
Always Noisy	31	11%
Usually Noisy	89	31%
Sometimes Noisy	135	48%
Quiet	28	10%
Total	283	100%

Ninety percent of those surveyed felt that their neighborhood was noisy. This corresponds quite closely to the percentage of those responding who live within the urban areas of the County. This correlation seems logical due to the generally higher densities which exist within the urban areas; i.e. higher densities could be expected to transmit more noise within any particular neighborhood than lower or rural densities, therefore the noise which does occur within the residential areas is perceived by the residents to be either infrequent or non-continuing in nature.

2. Principal Causes of Noise

The second question asked the participants was, "What causes the noise which bothers you?" Respondents had an opportunity to choose more than one cause of noise or indicate a category other than those listed. It is significant to note that the dominant majority (71%) indicated that noise generated by motorcycles was the most bothersome. Noise generated by cars and trucks was noted as annoying by 46% of the participants and 43% indicated that dogs were the principle cause of noise.

*Chavez vs. Municipal Court (1967) 256 Cal. app. 2d 149 and Sections 3340-3341 of Ordinance Code

Only a small percentage of respondents listed aircraft and industries as contributors to noise pollution. Four percent of the respondents felt that aircraft were bothersome, while 7% felt that noise from trains was annoying. Most of the respondents indicating that aircraft were bothersome live within the southeastern portion of the valley area of Tulare County (near Porterville and Terra Bella). Rail lines, which bisect a majority of communities within Tulare County, may represent a greater noise and vibration problem than the survey indicates. Tracks pass through many existing residential neighborhoods in communities such as Visalia, Porterville, Exeter, and Lindsay.

No one complained of noise from boats, which is understandable in view of the fact that there are no lakes or navigable waterways near communities. Eight percent of those responding felt that industry created noise problems.

Due to the rather specific nature of the written responses, many of the written statements took the form of complaints about specific problems. The principle types of written responses were those related to urban uses such as blaring loud speakers within athletic fields, cars driving over loose man hole covers, automobiles racing along residential streets, motorcycle racing at the County fairgrounds, sonic booms, and noise generated by school playgrounds. A few people complained of noisy air conditioners and garbage trucks.

Rural residents complained of noise from saw mills, agricultural pumps, gun fire, roosters, wind machines, chain saws, train motors, and other agriculturally related uses.

TABLE III

CAUSES OF NEIGHBORHOOD NOISE

Cause	No. of Responses	% of Respondents
Motorcycles	202	71%
Car or Truck Traffic	129	46%
Dogs	122	43%
Other	61	22%
Neighbors	28	10%
Industry	23	8%
Trains	20	7%
Aircraft	10	4%

*Note: Total figure greater than 100% due to multiple complaints

The question relating to the causes of noise is of critical importance for determining future abatement techniques. By analyzing the responses to this question, it was found that most of the noise generated occurs along traffic or circulation systems primarily within the urban areas of the County. The overwhelming majority (71%) of the respondents felt that motorcycles were the primary contributor of noise. Many of those who responded indicated that the motorcycles were generally too loud and complained of motorcycle use in vacant fields located within residential neighborhoods. Due to the large number of complaints about the noise from cars, trucks, or motorcycles, more attention must be given to land uses adjacent to major arterials. To determine actually who is responsible for noise attenuations of road-land use situations is difficult.

3. Frequency of Noise Bother

The third question of the survey was related to the frequency of noise generation. The respondent was asked how often noise was felt to be bothersome.

TABLE IV

NOISE FREQUENCY

Rate	No. of Responses	% of Total
Every Day	149	50%
A Few Times a Week	51	17%
A Few Times a Month	16	5%
A Few Times a Year	5	2%
Often at Certain Times of the Year	20	7%
Certain Times of the Day	56	19%

*Note: Total figure greater than 100% due to multiple complaints

The majority of those who responded to this question (50%) indicated that the noise most bothersome occurred every day. This response seems logical since most of the noise generators were cars, trucks or motorcycles, most of which are utilized for daily commuting to and from work.

While the frequency rate of "every day" received 50% of the responses, the next largest response was "a few times a week" with 17%. This response may reflect those individuals who do not live along major arterials but who have trucks or motorcycles impacting their neighborhood on a rather infrequent basis. Many of the respondents who indicated that motorcycles were a prime cause of noise stated that most of the problem occurred during the weekends. "A few times a week," response may also represent those who are annoyed by noise only on the weekends. A relatively small percentage (14%) indicated that the principle source of noise occurred infrequently. Nineteen percent responded to "certain times of the day" which may indicate that (1) noise is generated by traffic during peak periods or (2) that the respondents are more sensitive to noise during certain periods of the day such as early morning or late evening hours when they are trying to sleep.

It is interesting that 7% of the respondents indicated that the noise occurred "often" during certain times of the year. While this response was small, it is an indication that seasonal industrial uses do occur. Use of roadways for agriculturally related trucking, railways for produce distribution and airports for fire abatement may have an impact on ambient noise levels.

4. How Bothered

Those who participated in the survey were asked how the noise bothered them. The largest response (51%) indicated that the noise was "annoying." This percentage may imply that (1) the noise source is very loud, (2) the duration of the noise is significant, or (3) the frequency of noise is high. This high frequency could be defined as occurring daily. Forty-two percent and 45% respectively, acknowledged that the noise either "kept them from going to sleep" or "woke them up" while 40% indicated that the noise "made conversation or listening to the T.V., music or radio more difficult." Thirty-four percent stated that the noise "kept them from using their yard as often as they would have liked," and 26% and 28% respectively indicated that noise was either "startling" or "interrupted quiet work." These responses are of particular importance since numerous medical studies have indicated that noise which either interrupts an activity or startles an individual tends to generate specific physiological effects within the circulatory

system (increases the heartbeat, constricts blood vessels and can have damaging effects upon the human brain). Twelve percent of those surveyed responded to the category listed as "Other." These responses related to physical effects causing headaches, awaking infants, and hurting ears. Noise was also listed as a cause of insomnia. Other comments related to disturbance of conversation and listening to radio and television. Some of the respondents indicated that noise curtailed studying and/or hurt business. Schools, churches and open space recreation areas are also effected by noise, particularly when these kinds of land uses are not buffered or insulated properly.

TABLE V
EFFECTS OF NOISE

Effects	No. of Responses	% of Respondents
Annoying	145	51%
Wakes You Up	128	45%
Keeps You From Going To Sleep	120	42%
Makes Conversation or Listening to TV, Music, Radio More Difficult	114	40%
Discourages Use of Back Yard	97	34%
Interrupts Quiet Work	78	28%
Startles You	74	26%
Other	34	12%

*Note: Total figure greater than 100% due to multiple complaints

5. Vibration?

The fifth question of the noise survey asked whether or not noise made a respondent's house or apartment shake or vibrate. Twenty-five percent indicated that vibration did occur as a direct result of noise. The specific response to this question is indicated in Table VI.

TABLE VI
NOISE INDUCED VIBRATION

Does Vibration Occur	No. of Responses	% of Respondents
Yes	70	25%
No	214	75%
Total	284	100%

6. Loud?

The sixth question asked the respondents to indicate how loud they felt primary noise sources were. This question is subjective since individuals responded depending upon their tolerance levels. For example, one individual may consider the crying of a baby to be "not too loud" while another may consider it to be "extremely loud." The results of this question, then, should be viewed with the understanding that value judgments vary within populations. The majority of the respondents (56%) indicated that the noise was "extremely loud" with 29% indicating noise as "loud" and only 15% judging noise to be "not too loud." Results are shown in Table VII.

TABLE VII

NOISE INTENSITY

Intensity	No. of Responses	% of Respondents
Extremely Loud	144	56%
Loud	72	29%
Not Too Loud	35	15%
Total	251	100%

The "extremely loud" response correlates closely with the high annoyance rate as indicated with question #4 (regarding how noise bothers the respondent). The high rate of response to the extremely loud category also indicates that many of the residents within Tulare County are anxious to have the problem of noise pollution solved.

7. Government Response?

The participants within the community noise survey were asked to list the role which they felt local government should take in regulating noise. Of the 284 total respondents to the questionnaire, 84% or 237 responded to this particular question.

Enforcement

The answers varied in content, however, with the overwhelming majority indicating that enforcement of existing ordinances and regulations was needed, particularly regarding curtailment of noise which is emitted from poor muffler systems on automobiles and motorcycles. Many other individuals also felt that enforcement of existing ordinances which deal with disturbance of the peace would help considerably in the reduction of noise pollution within their particular community. Forty-eight percent of the respondents felt that existing regulations which dealt with noise, motorcycles, cars, hospital zones, and animals should be enforced by local government.

New Regulations

The second largest category in terms of response was that which dealt with the drafting of new regulations for the abatement of noise and the establishment of maximum noise level standards within any particular community. Of the total respondents to question #7, 18.6% felt that new regulations should be implemented which would help to curtail the existing rise of ambient noise levels within Tulare County.

Don't Know - "Some" Action

Some of the respondents (8.3%) indicated that they did not know what local government could now do to regulate noise. However, they felt that some action by local government should be taken in an effort to control noise. There were many other suggestions which have been categorically listed in Table VIII.

TABLE VIII

ROLE OF LOCAL GOVERNMENT

Role	No. of Responses	% of Total
Enforce Existing Regulations	115	47.9%
Develop New Noise Standards	45	18.6%
Don't Know, Want Some Action	20	8.3%
Lower Speed Limit	11	4.5%
Patrol For Noise Violation	10	4.1%
Remove Trucks From Residential Streets	10	4.1%
Zoning To Regulate Traffic Noise	6	2.5%
Regulate Industrial Noise	5	2.1%
Restrict Dogs In City Areas	5	2.1%
Land Use Control & Planning	3	1.2%
Listen To Citizens Opinions	2	0.8%
Restrict Outdoor Parties After 10:00 P.M.	2	0.8%
Reduce Train Speed In Urban Areas	2	0.8%
Reduce Noise From Railroad Crossing Bells	1	0.4%
Require Installation of Electric Water Pumps	1	0.4%
Control Plane Noise	1	0.4%
Local Government Should Be Accountable To State	1	0.4%
Establish A Noise Complaint Center	1	0.4%
Total	242	100.0%

As indicated in Table VIII, most of the respondents felt that general regulations and ordinances were required to abate noise within local communities.

Many of those who responded to this question felt that trucks which were operating along residential streets should be eliminated and such regulations were the responsibility of the local government. Others listed industrial and railways as noise sources and felt that regulation of these noise generators was a primary function of the local government. It is interesting to note that 3.7% of the respondents felt that noise control should be accomplished through the implementation of strict land use control using the planning and zoning process. A small percentage of the people, approximately 1.6%, felt that local government should "listen to the opinions and the needs of the people more closely." Some suggestions indicated that local government could possibly establish "a noise complaint center," in an effort to assist the local law enforcement processes in abating these noise problems.

While there were many specific suggestions for the process of abating noise within communities, most of those who responded to the questionnaire indicated that local government should take the initiative in attempting to reduce the noise problem.

8. Agriculture

Tulare County's main industry is agriculture. Therefore, it is necessary to analyze those noise sources which are created by agriculturally related activities. The respondents were asked "if they were involved in agriculturally related industry or agriculture," and if so, "what kinds of noise problem did they find to be disruptive?" The majority of the responses indicated that the primary source of noise was generated either by trucks or tractors. Other specific noise generators included internal combustion engines, agricultural pumps, wind machines, agricultural machinery, crop dusters, grinding of prunings, and the operation of packing houses. With a few exceptions, the above mentioned noise problems exist within the rural agricultural portion of the County. These particular responses relating to agricultural noise problems represent an additional 10% of the survey people not living in rural areas.

This additional 10% may live in the urbanized areas of Tulare County, but are affected by agricultural activities since much of the urban development occurs adjacent to or, in some cases, surrounded by agricultural land uses.

The respondents to question #8 were asked how the agriculturally generated noise affected their daily living environment. Of the total, 13% of the respondents indicated that the noise was disruptive to them when they were working, 57% indicated that the noise was disrupting to their family living environment within the rural areas, and 18% indicated that domestic animals have been disrupted by the noise generated.

9. Comments

Finally, the questionnaire asked to list any comments regarding the issue of noise pollution. The variety of comments can be seen in Table IX. Of the total number of respondents to the survey, 75% made some form of comment. The major comment related to motorcycle noise and possible methods of abatement.

TABLE IX

COMMENTS

Subject	No. of Responses	% of Total
Comments on Noise Sources:		
Autos & Trucks	64	22.8%
Motorcycles	60	21.3%
Dogs & Other Animals	49	17.4%
Neighbors	12	4.3%
Industry	11	3.4%
Trains	9	3.2%
Loudspeakers	7	2.5%
On Premise Engines	6	2.1%
Airplanes	4	1.4%
Wind Machines	1	0.4%
Air Conditioners	1	0.4%
General Comments:		
Glad to see County initiate Noise Study	26	9.3%
Disappointed in local enforcement Program	22	7.8%
Develop regulations to control noise problems	2	0.7%
Become accustomed to traffic noise	1	0.4%
Total	281	100.0%

As stated previously, 15.3% of the respondents indicated that motorcycle racing and resultant noise was a major complaint within the neighborhood. There was one specific area which accounted for 4.6% of the responses and that was the motorcycle racing at the Tulare Fairgrounds.



The early morning sounds of garbage collection may annoy some people but the need for refuse collection is an overriding public concern. Noise attenuation will eventually be possible

with the use of new trucks that are quieter. Plastic containers reduce noise also. However, new O.S.H.A. requirements for automatic backing warning bells add new noise sources.



The County hospital constructed in Tulare has gradually been engulfed by intense urban uses, fairground activities, and traffic.

New construction or site locations for critical facilities should be designed with noise avoidance as a primary concern.

Thirteen questionnaires indicated that the Fairgrounds were a direct source of disturbing noise. A petition (26 signatures) complaining specifically of the noise reaching their respective neighborhood was attached to one of the questionnaires. The administrator of the Tulare County Hospital also generated a specific complaint regarding the noise at the Tulare Fairgrounds from the motorcycle racing; indicating that such noise was in conflict with the hospital environment.

Of the respondents, 9.3% indicated that noise which was generated from traffic arteries was a major source of concern, and more specifically, loud and deficient mufflers were listed as primary causes of the adverse traffic noise generation. Another major source of complaints by those who answered the noise survey concerned noise which was generated either by the mobility of dogs who were unleashed within neighborhoods or the barking of dogs from within back yards of adjacent properties. Of the total respondents, 16.3% indicated that a major source of noise pollution within their Community was generated by dogs. The high percentage rate of response to the issue of dog generated noise can be attributed to the fact that the majority of the respondents lived within urban areas and within close proximity to their neighbors. Neighbors, as a whole, however, were only listed five times (1.8%) as generating noise which was detrimental to the living environment of the respondents.

While many of the respondents indicated that noise generated by traffic-ways served as a major source of noise pollution, some of the respondents (3.9%) indicated that industrial noise and noise which came from passing trains (3.2%) as well as noise which was generated by aircraft (1.4%) was bothersome to their local living environments. As was mentioned earlier, the very small percentage (1.4%) which replied that aircraft noise was a major problem indicates that past policies of locating airports away from the urban areas has been successful in reducing complaints which might otherwise be generated by aircraft noise.

One of the specific comments which was registered a total of seven times, or 2.5% of the total responses, dealt with a unique urban noise generator. Some of the respondents indicated that noise from athletic field loud speakers which penetrated surrounding residential areas was a major source of noise pollution within their neighborhood. Noise generation from areas of high use such as public gathering areas, schools, industrial and commercial sites should be located in such a manner so as to reduce as much conflict as possible between the intense activity and the residential areas within the community.

It was gratifying to note that 9.3% of those who responded to the questionnaire specifically stated that they were glad to see that the noise survey was being conducted and that they were given an opportunity to participate in the planning program. Nearly 10% of the respondents did specifically indicate that they were pleased to see local government taking some action in the planning for abatement of noise pollution. Most of those who responded had indicated that they did feel noise pollution was a major problem and that some steps by local government should be taken to resolve this growing problem within Tulare County.

D. Summary

Citizen participation is an extremely important component of any planning project, particularly those which deal specifically with the reactions of the general public. The community noise survey was distributed in an attempt to try and pinpoint specific problems which the citizens themselves felt required resolution. Upon reviewing the results of the survey, it can be seen that the majority of the respondents felt that noise pollution was an extremely important problem, that it should be solved, and that the noise survey is important in the planning program for Tulare County. The results from this noise survey will be used as base data for the formulation of the final recommendations and as base data for the development of the goals of the noise survey. In addition, the survey will serve as a comparative tool for looking at the real magnitude of the noise "problem" in Tulare County, and consequently for the allocation of resources to deal with problems considered to be significant and resolvable.

Chapter Four Goals

CHAPTER IV

GOALS

A. Introduction

The following goals are designed to provide a framework by which public response may be elicited and the County and cities can begin to resolve identified noise problems.

The goals set the overall tone of the County's program to eventually calibrate resources and manpower within the context of other County plans, policies and programs. As such, they should be updated periodically and changed to meet new opportunities presented by other levels of government.

Goals are broken into categories that are substantially covered within the context of the Noise Element.

B. General Policy & Management

The following general policies are adopted:

To implement County government activities to provide a quiet and liveable environment in Tulare County for protection of the health, safety and welfare of citizens.

To work with other levels of government where jurisdiction over noise pollution problems are not the primary responsibility of the County in order to achieve objectives expressed in the Noise Element.

To concentrate efforts toward solution of noise problems in and around urban areas where monitoring of noise levels and enforcement of design standards are most important, in concert with policies contained in the Urban Area Boundaries Element.

To channel the sporadic concerns and complaints of government leaders and citizens into a constructive channel that is directed toward eventual solution of noise problems in the County before they become significant. This requires acceptance by government and the community of some kind of constructive and positive program designed to provide scientific, factual answers to complex questions about noise. The Noise Element is a step in this direction.

To maintain the Noise Element as an ongoing part of the comprehensive planning program for Tulare County and the cities within.

To meet or exceed requirements specified by state and federal governments in the design and implementation of projects utilizing federal funds.

C. Land Use

To provide the best available environment for location of hospitals, schools, parks, and open areas in the County where relative solitude and quiet may be found.

To utilize the zoning ordinance, building codes, review procedures and other tools available for implementation of the Noise Element in conjunction with scientific data from the County Health Officer.

To utilize the latest available information and land use controls or guides to avoid noise conflicts. An example would be where airport zones have been established to avoid land use conflicts in and around the vicinity of major airports in the County.

To discourage the development of subdivisions in rural areas, outside Urban Area Boundaries, in order to avoid noise conflicts with agricultural industry.

D. Circulation

The Tulare County Planning Department and the Tulare County Public Works Department and CALTRANS should make a coordinated effort to insure that land uses adjacent to roadways are as noise-free as possible.

E. Environmental

To post areas to be designated as quiet zones, particularly around critical facilities such as hospitals, schools, homes, parks and rest homes or residential areas.

To work with state and federal officials in their attempts to reduce noise from trail bikes, dogs, automobiles and recreational vehicles in areas valued for solitude, and where tourist attractions of the County may be endangered by excessive noise.

F. Economic

To resolve noise problem conflicts related to locating of noise sensitive agricultural uses and urban land values; protect the economic assets of the County by proper land use planning.



Residential neighborhoods that are free from excessive noise are more healthful places to live. Neighborhoods designed to discourage thru traffic, low in density, and where

neighbors are respectful of others will eliminate many of the complaints filed annually with police departments.



Regulation of traffic arteries in communities is one option for decreasing noise levels and keeping circulation patterns in character with their surroundings. The Circulation Element, a required part of the General Plan for the County, should be

periodically updated to reflect findings of the Noise Element. Where it is found that traffic is not in keeping with the character of neighborhoods, then recommendations can be formulated for mitigating the noise problem.



The California Highway Patrol monitors noise levels adjacent to State Highways. Vehicles are cited for excessive noise. The California Highway Patrol does not monitor community

noise levels. Monitoring of community noise levels is a function remaining for local governments to undertake.



What is a park? For most people, a park is a place to be away from their usual environment. Active recreation areas should be separated

from passive recreation areas if a park is to serve the need for solitude and an environment free of excessive noise.



Exterior view of the modern acoustically controlled Kaweah Delta Hospital adjacent to State Route 198 in Visalia. The depressed freeway design, interior design, and well

planned space make for a good hospital environment. In addition, the close proximity to the high speed freeway can result in saving of lives when minutes count.



This photograph was taken at the Veva Blunt Elementary School in Visalia. Carpeting, air-conditioning and solid construction prevent penetration of outside noise and depress indoor noise, thus allowing for more informal

classroom experiences and utilization of the "learning center technique". Space can be altered to meet changing demands within the "learning center". In this case, it "pays" to reduce noise.



A typical pasture scene in Tulare County. Livestock, if subjected to continual disturbance from noise, suffer physical stresses similar to people. United States Air Force Studies

indicate that milk production, however, cannot be equated with aircraft noise. Noise of various kinds is thought to affect natural wildlife species in terms of composition, density, and distribution.

Chapter Five

Land Use and Noise Pollution

CHAPTER V

LAND USE AND NOISE POLLUTION

A. Introduction

The State of California has mandated that local agencies shall prepare noise elements to monitor and evaluate the problems within local areas. The guidelines indicate that desired maximum noise levels by land use categories and standards and criteria for compatible noise levels for local fixed point noise sources shall be studied within the content of these local noise elements.

This section of the noise element will analyze, in detail, the land uses which currently exist within the incorporated cities and within the County unincorporated areas, to determine which specific uses are generating excess noise and which uses are critically impacted by noise pollution. It is a primary goal of this element to provide data which can be easily adopted and used by each of the incorporated cities for fulfillment of their requirements to produce noise elements as part of their general plans.

When we refer to "land use" in planning terms, we are speaking specifically of all of the various types of uses that exist within a community, which range from industrial uses to parks, schools and residential areas. The arrangement of various land uses is important to the efficient functioning of any given area. There are many land uses which, by their nature, cannot coexist with other forms of land use. Industries, for example, require streets which can support large trucks and industrial uses as well as traffic during peak hours. Residential areas, on the other hand, require smaller streets and demand that the traffic rates be low in order to preserve the quality and safety of the residential neighborhood. Industrial and residential areas cannot coexist side by side very well since their basic needs are incompatible.

It is therefore a primary goal of land use planning to arrange various land uses in such a way as to assure that those uses which are incompatible will be suitably separated from one another thus reducing potential conflicts. There are many non-harmonious land uses, however, which may currently exist and these areas must be identified and policies must be developed which will provide for the mitigation of these conflicts. The Noise Element will identify those land uses which are principally generating noise and those land uses which are critically impacted by noise, thus conflicts between these two opposite elements can be identified and mitigating measures can be recommended.

B. Critically Impacted Land Uses

While there are many types of land uses which exist within both the rural unincorporated area and the urbanized portions of Tulare County, some are more critically impacted by noise than are others. Those land uses which are noise sensitive are as follows:

schools	churches
parks	hospitals
rest homes	libraries
museums	camping areas
picnicking areas	hearing clinics
natural wildlife areas	historic monuments
	reading rooms
cultural activities & nature exhibitions	

It is of vital importance that those land uses which are noise sensitive be isolated or buffered adequately from those uses which are generating excess noise (that above the ambient level). As does every individual, each land use can be said to have a different tolerance rate for various types and volumes of sound. Those uses which are located outside and have no exterior buffering, are exposed to noise to a greater degree and may be more noise sensitive. Other uses, by their nature, may require a quieter atmosphere.

Rest homes and hospitals require a quiet atmosphere. Other land uses which are critically impacted by noise, but do not demand as quiet an atmosphere as do the ultrasensitive uses may be located in areas of higher ambient noise levels. Schools and churches are examples of land uses which require a relatively quiet environment. Schools and churches do not, however, require the ambient noise level to be as low as it must be for rest homes and hospitals.

In an attempt to provide a data base which could easily be used and adopted by each of the incorporated cities, the Noise Element will analyze those land uses which are critically impacted by noise and exist within each of the urban areas of Tulare County. All of the uses which are critically impacted by noise have been identified upon the land use maps and principally include schools, hospitals, libraries and parks. All of those land uses which are critically impacted by noise have been plotted with respect to their relationship with major arterial highways and railroad lines as well as noise generating land uses.

Upon close analysis of the land use patterns* which currently exist within each of the cities, it can be generally stated that good separation between conflicting land uses does presently exist.

There are, however, unique situations of conflict within each urban or urbanizing area.

The land use patterns which have been delineated within each of the incorporated cities is general in nature and only identifies those critically impacted land uses which are of greatest concern with respect to noise pollution. Each of the individual cities may wish to more specifically identify local land use problem areas (i.e., ball field with loud speakers located within a residential district, outdoor meeting areas, vacant lots used for motorcycle racing, etc.) within their adopted noise elements and these areas should be identified upon each of the individual city's land use maps.

The detailed analysis of critically impacted land uses has been conducted primarily within the urbanized areas of Tulare County, there are, however, areas which are located within the rural portion of the County as well as those located within the foothills which are critically impacted by noise. Within Tulare County there are approximately 40 unincorporated communities ranging in size

*Survey completed in September 1974

from under 100 people to over 5,000 people. Noise pollution is a problem wherever people are present to perceive the noise. Thus, where there is concentrated urbanization, problems of noise pollution are more apt to occur.

The community noise survey indicated that only 11% of those people who responded to the survey lived within rural unincorporated areas. Thus, it can be generally stated that the majority of the noise problems do exist within the more urbanized and usually incorporated areas.

The community noise survey was conducted within the first phase of the Noise Element and indicated areas impacted by noise. Each individual responded to a noise problem which they deemed to be important. The survey respondents indicated problem areas which were related often to land use relationships. The residential neighborhoods are not identified as critically impacted land uses, for the ambient noise levels which can be tolerated within a neighborhood are mostly beyond the role and function of local government, therefore, public facility location (i.e., hospitals, schools, parks, etc.) must be of primary concern to local government. There was, however, a high response rate from residential neighborhoods since they comprise the living environment for nearly all the people within the incorporated areas.



The photograph above shows a typical wind machine in the citrus belt of Tulare County. During frost seasons these machines are periodically in operation. The Noise Element does not suggest that these kinds of uses in agricultural zones are detrimental to people's health.

Land use considerations in and around citrus belts may require recognition of the fact that there is potential periodic noise to be found in these areas and the problem should be recognized through the environmental impact assessment process as necessary.

FIGURE 4

SOUND LEVEL AND LOUDNESS OF TYPICAL NOISES IN INDOOR AND OUTDOOR ENVIRONMENTS**

db(A) Ref.: 0.0002 H bar	SUBJECTIVE IMPRESSION	COMMUNITY* (Outdoor)	HOME OR INDUSTRY* (Indoor)	RELATIVE LOUDNESS (Human Judgment of Different Sound Levels)
130		Military Jet Aircraft Take-Off With After- Burner From Aircraft Carrier @ 50 Ft. (130)	Oxygen Torch (121)	32 Times As Loud
120	Uncomfortably Loud	Turbo-Fan Aircraft @ Take-Off Power @ 200 Ft. (118)	Riveting Machine (110) Rock-N-Roll Band (108- 114)	16 Times As Loud
110		Jet Flyover @ 1000 Ft. (103) Boeing 707, DC-8 @ 6080 Ft. Before Landing (106) Bell J-2A Helicopter @ 100 Ft. (100)		8 Times As Loud
100	Very Loud	Power Mower (96) Boeing 737, DC-9 @ 6080 Ft. Before Land- ing (97), Motorcycle @ 25 Ft. (90)	Newspaper Press (97)	4 Times As Loud
90		Car Wash @ 20 Ft. (89) Prop. Plane Flyover @ 1000 Ft. (88), Diesel Truck, 40 MPH @ 50 Ft. (84), Diesel Train, 45 MPH @ 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	2 Times As Loud
80	Moderately Loud	High Urban Ambient Sound (80), Passenger Car, 65 MPH @ 25 Ft. (77), Freeway @ 50 Ft. from Pavement Edge, 10 AM (76 +6)	Living Room Music (76) TV-Audio, Vacuum Cleaner (70)	70 db(A)
70		Air Conditioning Unit @ 100 Ft. (60)	Cash Register @ 10 Ft. (65-70), Electric type- writer @ 10 Ft. (64) Dishwasher (Rinse) @ 10 Ft. (60) Conversation (60)	1/2 As Loud
60		Large Transformers @ 100 Ft. (50)		1/4 As Loud
50	Quiet	Bird Calls (44) Lower Limit Urban Ambient Sound (40)		1/8 As Loud
40				
	Just Audible	[db(A) Scale Interrupted]		
10				
	Threshold of Hearing			
0				

*Numbers in parenthesis are A-Levels

**Branch, Melville Co. and R. Dale Beland, "Outdoor Noise and the Metropolitan Environment--
Case Study of L. A. with Special Reference to Aircraft," Department of City Planning, Los
Angeles, California, July 1970



Some noise is temporary and necessary -- but the cumulative effect is a rise in the ambient

(background) level and consequently a rise in complaints as one noise is stacked upon another.

Each individual has a separate noise tolerance level which, even by individual, will vary with the time of day and with the condition of the environment within which he is located. One person, for example, may not consider a crying baby to be a source of noise pollution, while another may consider this source to be extremely annoying. Within the residential neighborhoods, those residents who are employed within professional and industrial areas may be able to tolerate high ambient noise levels within their offices or industries, while they will not tolerate that same ambient noise level within a residential neighborhood, once they return to that neighborhood in the evening. The noise levels which can be tolerated within residential areas may also vary by the time of day and the day of the week. Noise levels which are of a higher ambient rate may be tolerated during the middle of the day, particularly when fewer people are located within those residential areas since they are at their offices, than would be tolerated after 10:00 P.M. in the evening, when these people are trying to sleep. This thesis was reinforced within the community noise survey, with a large percentage of the respondents indicating that the noise which did occur in residential neighborhoods was extremely annoying and tended to affect their capacity to fall asleep, or in many cases woke them up. The impact of noise, then, within a community is dependent upon the physiological and sociological tolerance levels of those inhabitants within a particular area. The tolerance level of inhabitants within either a mental hospital, convalescent home or hospital area is much lower than that of a residential area, which in turn would be much lower than the tolerance level of an industrial area.

The theory that certain uses have a lower tolerance rate such as hospitals, convalescent homes was borne out by the community survey which indicated that there are specific noise problems around hospital areas within Tulare County. Numerous comments were submitted along with the responses which indicated certain hospital areas within Tulare County were critically impacted by noise generating land uses. In some cases it may be possible to mitigate the problems by administrative means as opposed to changing land uses or requiring costly improvements.

This noise element identifies those areas which are critically impacted by noise, as well as those sources of noise generation in an effort to fully describe the conflicts between land uses. Recommendations are suggested to mitigate conflicts in order to provide a quieter living environment for all of the Tulare County residents.

C. Primary Noise Generating Land Uses

While certain uses within any given area are critically impacted by noise, there are some uses which generate higher degrees of noise than do others and these have been identified upon the land use maps. Examples of noise generating land uses are as follows:

public assembly areas	amusement parks
industrial uses	bus terminals
railroad switching yards	airports
motor freight terminals	heliports
baseball fields	pistol ranges
livestock yards	animal kennels
poultry raising areas	auto wrecking yards

For use of this Noise Element, the principal noise generators have been plotted on the land use maps and include highways, airports, outdoor gathering areas and industrial sites.* These are considered to be the prime noise generators within Tulare County. Each of the incorporated cities may wish to study and identify specific noise generators which exist within their incorporated boundaries, but have not been located upon the land use maps found within this element. A more detailed analysis of noise generators combined with an analysis of the critically impacted land uses would provide a city with an accurate and precise accounting for any noise land use conflicts which may exist, thus allowing them to develop abatement procedures either through their own resources or in conjunction with the County through a service agreement.

As discussed in the previous section, the emittance of noise from any particular source is rated as either standard or above standard depending upon how it is perceived. The way that noise is perceived is dependent upon a number of variables such as distance between the noise generator and the noise receiver, the ambient level, the frequency of the noise, the time of day, and the type of noise.

*Plate I

Industrial uses may be high noise generators during the day but their impact on the surrounding areas may not be critical if those areas which surround the noise generator are less noise sensitive during the time periods which the noise generator is emitting noise above acceptable levels. Certain noises are considered to be acceptable such as ambulance and fire truck sirens, garbage pickups (although these can be quieted with the use of plastic containers instead of metal).

The majority (89%) of the response to the survey was from residents of incorporated cities which indicates that the primary noise problems exist within those areas of higher density where noise generation is perceived by a greater number of individuals. It is important, therefore, to clearly identify the noise sources, particularly in relationship to adjacent land uses which are within a range of noise susceptibility.

Tulare County is rural in character. There are unique rural fixed point noise generators which are not located within the urbanized areas and have not been specified as problems by the respondents from the urbanized places. Fixed point generators are basically related to the agricultural industry and deal more specifically with saw mills, agricultural pumps, wind machines, animal raising areas and in some cases, gun fire.

These agriculturally related noise sources are perceived by only a few people within the County and do not generate a substantial continuing problem. Unfortunately, these noise sources vary from one area to another in frequency, duration, intensity, and in type, thus making specific policy recommendations for their abatement and control very difficult unless the background ambient noise level is already high. There are specific areas within the rural portion of Tulare County which should be studied individually and recommendations made for future noise abatement, particularly near recreation areas since the entire County benefits from high quality recreation facilities and tourism.

While residential neighborhoods are neither considered critically impacted land uses nor primary fixed point noise generators, they do have unique problems of their own. The survey responses indicated that in the residential neighborhoods, certain noise generators existed which were creating numerous problems and should be considered a form of noise pollution or public nuisance. Loud dogs,

for example, were considered a problem within their neighborhoods by 43% of the persons answering the questionnaire. Noisy neighbors were a source of discontentment by 10% of the respondents.

Some neighborhood noise sources are controllable, particularly those which are related to mobile sources such as motorcycles, auto traffic and truck traffic along residential streets. Those noise sources which can be controlled through local ordinances and are perceived as noise problems are addressed within the implementation section of this document.

Each of the major noise generators (airports, industries, bus terminals, animal kennels, and outdoor gathering areas) have unique characteristics and generate different types of noise within each community. Probably the most critical of all of the noise generators and that which has received the most attention, is that of airport noise generation. Airports can be considered a fixed point noise source, due to their stable location with relationship to other land uses in the community. The detailed analysis of control and monitoring of airport noise is described in the section on circulation and noise. It is important, however, to briefly analyze the impact that an airport has upon a community and to briefly analyze the existing problems which exist within the incorporated city areas.

Within many parts of the state, land uses of residential character have been permitted to develop adjacent to airports within their flight path.³⁹ Serious problems have occurred where noise produced by jet aircraft within approach zones has created tremendous upheavals within communities.

The Federal Aviation Administration has attempted to abate the problem of airport noise pollution by indicating those areas within which a substantial amount of noise occurs through the use of noise contours or footprints. Unfortunately, in many cases, such procedures have been developed too late to reduce the conflicts which have already been generated. Loss of property value and increased ambient noise levels to surrounding neighborhoods has been the result of poor planning within many communities. The environment surrounding Tulare County airports is discussed in Chapter Six.

Within Tulare County there has been a definite practice to isolate airports and buffer them from urbanized development. This may be noted by the location of major airports with distances of between 2 and 4 miles from urbanized development of the three large urban cities of Tulare County (Porterville, Tulare and Visalia). The community noise survey indicated that there were very few criticisms of excess noise which were generated from these airport facilities which indicates that the practice of physically separating the airport from noise sensitive urban development and residential neighborhoods has been extremely successful. A county which is primarily rural in nature and has congregations of urbanized development, is extremely fortunate in that there is a vast amount of land upon which to locate extremely noisy uses, such as an airport, without the problems of conflicting land use. It must be noted that while there is currently a physical separation between major airports and the incorporated areas, there must be adequate safeguards to protect future development from encroaching within an area which would be subject to extreme noise. The role of land use planning will be critical with respect to the preservation of those areas which surround the airport facilities within Tulare County.

A detailed analysis of the existing airport facilities and projected noise levels within these facilities is presented in Chapter Six which specifically identifies existing problem areas and makes recommendations for abatement of noise, relying primarily upon land use controls for implementation.

Within the community noise survey, approximately 4% of the responses indicated that industrial noise was a major source of noise pollution within their specific neighborhood. Of all the fixed point noise sources, which are prime generators of noise, those which are industrial in nature have been identified as producing the greatest problems. Although industrial areas were listed as the primary source of noise generation for those which are of a fixed point nature, only 4% of the respondents indicated that they were bothered by industrial noise. Therefore, it can be assumed that there are relatively few major land use conflicts between those uses which are critically impacted by noise and industrial areas within Tulare County.

In land use planning, it is critically important to identify the circulation routes which exist within a community and the carrying capacities and surrounding land uses along those routes. Land use and circulation are interrelated, thus you may have situations which exist where land uses are physically separated from noise sensitive land uses, (i.e., residential, hospitals, parks), however, the industrial land uses may generate traffic which will have an adverse impact upon the noise sensitive uses.

For many years there was little control over the location of industrial sites within any particular urbanized area. Only recently has land use planning practice and zoning been able to substantially control the growth and development of urban areas with respect to specific locations for industrial uses. There has been a common practice in the past to locate industrial sites haphazardly throughout a community, generally along railroad lines and other major transportation routes. The more recent practice of locating and sighting of industrial uses within a community has resulted in industrial parks. In an effort to congregate all of the industrial uses together in common areas so that they could service one another and in order to more efficiently provide the utilities and services that are required by an industrial area, aggregation of land use types has occurred. This is also true of other uses such as residential parks, schools.

As revealed by the Noise Survey, a relatively few responses indicated that noise from industries was considered to be a major source of pollution. A close analysis of the existing land use patterns within the incorporated areas indicates that the problem of conflicting land uses, particularly between industrial sites and those which are critically impacted by noise is relatively nonexistent and that wise land use practices have been followed with the urbanized areas. It is important that those land uses which do generate excess noise be identified and that they be physically buffered from those uses which are critically impacted by noise through a continued and expanded program of wise land use management.

A source of noise which is of a fixed point nature and rather unique in character is that which is generated from outdoor gathering areas. Of those who responded to the questionnaire, approximately 2-1/2% indicated that they were bothered by noise from loud speakers which was emitted from nearby outdoor gathering areas. Such noise generation does occur on an infrequent basis, however, it does cause problems within an urban area and wise land use planning for the future location of such sites should be used. Areas which are used for public gatherings have been identified upon the land use maps and it is important that they be buffered from adjoining land uses which are impacted by noise. In most instances, those land uses which do generate outdoor activities, have been located along major arterials and are relatively isolated from those uses which are critically impacted by noise. There are a few instances, however, where conflicts between residential districts and outdoor gathering areas do occur, particularly when loud speakers are being used.

While industrial areas cause numerous noise problems, particularly with respect to generation of truck traffic, outdoor gathering areas also are creating problems of noise generation which may not be directly related to their location with respect to critically impacted uses. It is again important to analyze the circulation system with respect to land use in an effort to identify by which routes those who are attending these public gatherings travel, so as to avoid conflicts of circulation generated noise pollution within residential neighborhoods which have been created by poor location of an outdoor gathering area.

There are some very specific uses which are located within the County and the incorporated cities which tend to cause conflicts with noise sensitive land uses. There were no comments which related to transportation depots or animal kennels within the community noise survey, however, these specific land uses are capable of generating noise in excess of the allowable standard, therefore, their placement within communities must be carefully viewed with respect to adjoining land uses.

D. Land Use Planning and Noise

Land use planning is a tool which may be used to buffer and isolate those uses which are critically impacted by noise from those uses which are primary noise

generators. Through wise and efficient land use management, the majority of noise pollution, particularly that which is created by fixed point noise sources, may be abated. Each land use within a community demands various types of environments within which to efficiently thrive. Residential areas, hospitals and parks, demand that the local environment be of a serene nature in order to provide the quality of environment which is demanded by local residents. Other land uses, demand railroad spurs, good circulation routes and direct access to industrial/commercial sites. The basic patterns of development within any particular community will vary, however, an attempt should be made to clearly separate those critically impacted land uses from primary noise generators as well as to adequately plan for the buffering and separation of major circulation routes and critically impacted noise receivers.

Each form of land use can tolerate various levels of noise intensity. It has been established that there are certain land uses which can be considered to be critically sensitive to noise and can tolerate only low ambient noise levels in order to function properly. Each land use must have a set standard for the emittance of ambient noise within which normal functioning may proceed. Chart 2 contains recommendations for ambient noise level standards which should occur within each land use area.

The ambient noise level standards which are shown in Chart 2 have been broken down into three basic categories: the lower range allowable db(A) standards for land uses are those which are critically impacted by noise and thus require a lower ambient noise level. Those land uses which are indicated in the mid range, demand ambient noise levels ranging from 50 to 60 db(A)'s during daylight hours, with some demanding a maximum of 45 db(A)'s during the evening hours. These mid range land uses are not critically impacted by noise, however a moderate range ambient noise level must be maintained in order to preserve the physical and economic environment within which they exist. The moderate range land uses primarily consist of residential, agricultural and neighborhood commercial facilities, all of which can be negatively impacted by noise pollution, however, through wise land use planning and application of acceptable noise level standards, preservation of their functional environment will be assured.

CHART 2
RECOMMENDED AMBIENT ALLOWABLE
NOISE LEVEL OBJECTIVES*

IMPACT	LAND USE	7 A.M. to 10 P.M.	10 P.M. to 7 A.M.
Critically Impacted Land Uses	Hospitals/Mental Facilities	45 db(A)	40 db(A)
	Passive Recreation Areas	45 db(A)	45 db(A)
	Schools	45 db(A)	45 db(A)
Moderately Impacted Land Uses	Agriculture	50 db(A)	50 db(A)
	Low Density Residential	50 db(A)	50 db(A)
	Multi-Family Residential	55 db(A)	50 db(A)
	Neighborhood Commercial	55 db(A)	55 db(A)
	Professional Office	55 db(A)	55 db(A)
	Retail Commercial	60 db(A)	55 db(A)
	Outdoor Stadiums & Active Recreation	70 db(A)	70 db(A)
Primary Noise Generators	Light Manufacturing	70 db(A)	65 db(A)
	Heavy Manufacturing	75 db(A)	70 db(A)
	Airports**	75 db(A)	70 db(A)
	Pistol Ranges	75 db(A)	70 db(A)

Techniques for measuring noise levels must be established after purchase of particular types of measuring equipment. In addition, the Ordinance adopted by cities or the County must specify procedures for taking noise readings.

*These levels should be measured at the property line, 36 inches above the ground.

**Areas within the noise "footprint" area may have higher sound levels while aircraft are being tested or taking off and landing.

The last category in Chart 2 shows those uses which are primary noise generators and are generating noise in excess of 60 decibels during any 24 hour period. The primary noise generators consist of all of the manufacturing uses as well as some special uses such as airports, outdoor stadiums, and pistol ranges which, by their nature, transmit noise levels in

excess of the moderate range. Those uses which have been identified as primary generators must be carefully planned in relationship to both the moderate range uses and particularly the critically impacted uses, so as to avoid any access ambient noise level which would exceed the levels prescribed for both the moderate and critically impacted land uses.

Land use conflicts may take various forms and this report will specifically analyze those which are created through noise pollution. Due to the demand by the lower intensity uses for a relatively quiet ambient noise level, the primary responsibility for control of noise will be placed upon the noise generators. Those land uses which have been indicated within the critically sensitive and mid range levels (i.e., hospitals, schools, residential areas, commercial areas) must be protected from noise which would exceed the maximum ambient noise levels which have been indicated for each of the specific uses on the chart. For application of noise abatement, the standards can be applied to the moderate and low range uses and should be calculated from the property lines closest to the noise generation. A low density residential section, therefore, should not have an ambient noise level which exceeds 50 decibels during the day and 45 decibels during the evening.

The noise generators may take basically two forms: those which are generated within a district and those which are generated from adjacent land uses. Noise may be generated from within a district such as low density residential and should this noise generation exceed the maximum of 50 decibels between 7:00 P.M. and 10:00 A.M., then enforcement measures should be taken. Noise generation from within a district may take the form of excessive automobile repair within a residential area, barking dogs, loud noises generated from individual dwellings, or any of the specific types of complaints which were indicated within the Community Noise Survey.

Noises which are generated within a district must be controlled and the maximum ambient levels must be maintained in order to assure that the general health, safety and welfare of all the residents is adequately safeguarded. There may be cases for instance where a manufacturing use is located next to a residential use. The maximum decibel level allowed within the residential area may be 50 decibels while that allowed for the manufacturing area is 75. In this case there is a 25 decibel range difference between the two land uses. In order to maintain 50 db(A) levels within the residential neighborhood, the primary noise generator must institute measures to control and abate the noise so that the level does not exceed the maximum allowable standards for adjacent uses. More precise analysis of

abatement techniques which may be taken to control noise from fixed point sources is provided within the noise abatement procedures of the report. (Chapter VII)

These land use noise standards represent the maximum levels that should be allowed within Tulare County. Many state and federal agencies and other local governments have established maximum noise standard levels which they have applied for their specific needs. Those levels which have been proposed within this section of the noise element for general use within Tulare County recognize the need for certain urban uses while at the same time recognizing that the general ambient level of noise within a rural county such as Tulare will be, on the whole, relatively low. The standards are sensitive to the need for preservation of a quiet environment.

Noise level standards have been developed for many cities and counties throughout California and when these standards are compared to those proposed within this section, it can be concluded that the proposed standards for Tulare County are reasonable and conservative. The chart below indicates the recommended standards by the League of California Cities for protection of a suburban environment.

CHART 3

Sound Level A, decibels
Community Environment Classification

Zone	Time	Quiet (suburban)
R1 and R2	10 pm to 7 am*	45
R1 and R2	7 pm to 10 pm	50
R1 and R2	7 am to 7 pm	55
R3 and R4	10 pm to 7 am	50
R3 and R4	7 am to 10 pm	55
Commercial	10 pm to 7 am	55
Commercial	7 am to 10 pm	60
M1	anytime	70
M2	anytime	75

*Reflects normal sleeping hours when noise is considered most bothersome. In addition, daytime background levels are normally higher.

E. Conclusions

The noise problem is intensified by conflicts between land use characteristics. If we are to design programs for the abatement of noise pollution in any urban or rural areas of Tulare County, wise land use planning must be implemented and stan-

dards must be enforced. The primary goal of the Noise Element is to provide a quieter living environment in order to protect the general health, safety and welfare of all of the residents of Tulare County. Land Use Planning is a primary tool that can be used to provide a healthier and more quiet living environment in conjunction with judicious use of adequate noise standards.

The land use standards are indicative of the needs which exist within the local communities of Tulare County and have been established in an effort to preserve an ambient noise level which will provide the quality of life demanded by the local residents. These standards should also assure that no future development will adversely affect any existing uses within our local communities. The basic premise behind the noise standards proposed is that it is the responsibility of the noise generating individuals to control and abate the noise which is emitted from their development and to protect the noise level standards which have been established for adjacent land uses. Should a situation occur, for instance, where an industrial site is located adjacent to a residential use, then it would be the responsibility of the industrial development to abate the noise generation so that once it is received at the property line of the lower intensity use (hospital, etc.) it should not exceed the maximum ambient noise level as indicated for that adjacent land use. The form of abatement which is taken in order to conform to the noise level standards, will vary by design and cost.

While all land uses have been generally identified within the noise standard chart, many have been classified as critically impacted by noise or identified as primary noise generators. These land uses represent the extreme of either low noise level standards or extremely high level standards (under 50 decibels and above 65 decibels). Those land uses

which have been identified as critically impacted have been delineated upon the land use maps and are specifically those uses which need to have low ambient noise levels for efficient functioning of the use itself. Those uses which have been identified as primary noise generators are producing noise as a result of their general operation and daily functioning and it is recognized that, in many instances it may be economically unfeasible or impractical to substantially reduce the on-site noise generation, particularly from industrial sources. The standards and abatement practices will then be used as a basis for abatement practices which will then be used as a basis for abatement procedures which can be implemented on the site which can reduce the noise proliferation from the high intensity uses in an effort to reduce the conflicts which exist between those uses which are impacted by noise and those which are the generators.

Through wise and efficient land use planning, it is intended that future conflicts will not develop, thus saving both the noise receivers and the generators from costly site design changes in efforts to reduce the noise and to meet the minimum levels as established.

F. Recommendations/Standards

The following recommendations have been made in an effort to precisely identify the most critical issues related to land use and fixed point noise sources and should be used as a basis for implementation of noise standards within Tulare County.

In addition each city and the County should review the model Noise Ordinance in the appendix, prepared by the League of California Cities.

It is recommended that the Model Noise Ordinance be used as a basis for development of noise ordinances in the County in order to insure continuity between the County and cities.

NOISE-CRITICAL FACILITIES

The adjacent map entitled Critical Facilities and Noise shows those facilities that are considered to be critical in terms of noise generation or the receiving of noise. They were plotted utilizing data obtained from the survey undertaken in the spring of 1974 as well as data gathered from the Chamber of Commerce.


Further study should be undertaken to determine noise levels in and around these critical facilities so that in the future a determination can be made by the Board of Supervisors as to the severity of the noise levels in and around these facilities. This study does not attempt to show noise levels other than on a mathematical basis. In many cases it is evident that a noise problem does not exist even though a hospital for example may be adjacent to a State Highway. This is due to the construction techniques used in building the hospital and the design of the highway. Other examples are noted throughout the text.





PLATE 1 **NOISE - CRITICAL FACILITIES**

TULARE COUNTY




LEGEND

PRINCIPAL NOISE GENERATORS

-  AIRPORTS (WITH FOOTPRINTS SHOWN FOR VISALIA, PORTERVILLE, TULARE)
- HIGHWAYS (GENERALIZED NOISE LEVELS USING CALTRANS L10 PROCEDURE)*

 -  75 db(A)
 -  65-75 db(A)
 -  45-65 db(A)
 -  45 OR LESS/NO DATA AVAILABLE

CRITICAL FACILITIES - NOISE RECEIVERS

-  SCHOOLS
-  HOSPITALS, MENTAL FACILITIES, REST HOMES
-  RECREATION FACILITIES (PARKS, GOLF COURSES)

*ASSUME 65 MPH STATE ROUTES AND APPROXIMATELY 200 FT. FROM NEAREST TRAVEL LANE.

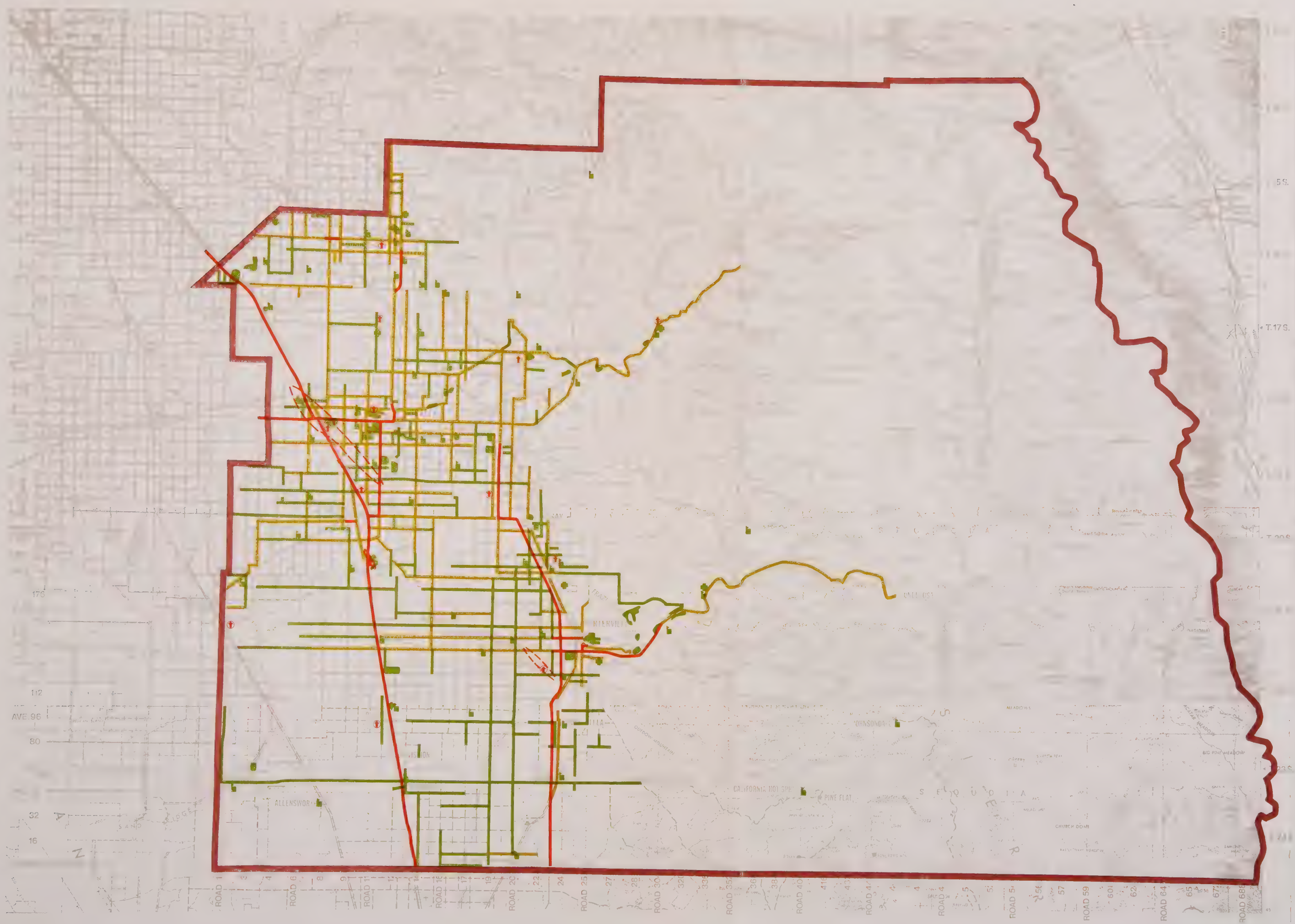
*COUNTY ROUTES ASSUME 55 MPH AND APPROXIMATELY 100 FT. FROM NEAREST TRAVEL LANE.

Sources: •Tulare County Public Works Department
 •Tulare County Planning Department
 •Five County Seismic Safety Element Part II
 •CALTRANS
 •August W. Compton & Associates (Airport Data)
 •Tulare County Airport Master Plan

November 1974



PREPARED BY TULARE COUNTY PLANNING DEPARTMENT



Chapter Six

Circulation and Mobile Noise Sources

CHAPTER VI

CIRCULATION AND MOBILE NOISE SOURCES

A. Introduction

The noise level in the United States has been allowed to increase at the rate of one decibel per year for the last 25 years. Combining this with the country's distinction of leading all other nations in roads and airports, the U.S. could be labeled as the noisiest and best traveled country in the world.

In Tulare County, noise emanates from the sky, via airplanes; from highways, via automobiles, trucks, and motorcycles; from railroads, via trains; from farms, via tractors, cotton pickers and grain harvesters; and from recreational areas, via trail bikes, motor boats, race cars, and snowmobiles. The following list is an approximate decibel rating for various forms of mobile noise sources.¹⁷

Source	Decibels
jet plane takeoff	150
jet liner (500' overhead)	115
motorcycle	111
snowmobiles	104-106
outboard motor	102
heavy automobile traffic	100
farm tractor	98
garbage truck (200' away)	85
automobile	70

In Tulare County many of these extreme sources of noise (i.e., jet aircraft and heavy automobile traffic) are relatively rare. The Tulare County Community Noise Survey (April, 1974) substantiates this statement. Of the 284 responses to this survey, motorcycles (71%) were the major cause for complaints. Automobile and truck traffic were a distant second with 129 or 46% of the complaints. The larger forms of mobile noise sources, trains and aircraft, accounted for only 7% and 4% of the complaints respectively. This noise survey parallels a similar survey done by the San Joaquin County Council of Governments. There, motorcycle complaints composed 61% of the responses, vehicular traffic - 59%, trains 16%, and aircraft 3%. The percent breakdown of the previously mentioned noise surveys are as follows:

CHART 4
CAUSES OF COMMUNITY NOISE

Cause	TULARE COUNTY % of Respondents
Motorcycles	71%
Car & Truck Traffic	46%
Dogs	43%
Other	22%
Neighbors	10%
Industry	8%
Trains	7%
Aircraft	4%

*Number of Responses - 284

Source: Tulare County Planning Department
1974

CAUSES OF COMMUNITY NOISE

SAN JOAQUIN COUNTY

Cause	% of Respondents
Motorcycles	61%
Other Vehicular Traffic	59%
Dogs	22%
Trains	16%
Miscellaneous	15%
Neighbors	13%
Industry	9%
Planes	3%
Practicing Bands	3%

*Number of Responses - 300

*Courtesy of San Joaquin County Council of Governments 1974

B. Principals of Physics (From Chapter Two)

The relationship of sound measurement to circulation patterns and mobile noise sources is modified by a set of complex variables. There are a myriad of physical conditions that can both amplify and muffle the condition of sound. Slope, vegetation, and man-made structures generally decrease or reflect sound waves; while water bodies and foothill/mountain canyons may actually amplify or create a condition of repetitive sound waves (echo). Distance and open space will mitigate noise. This mitigating condition is proportional to the distance between the noise source and receiver. A rule-of-thumb is that noise drops 6 db(A) for each doubling of distance.⁷ (See Appendix C) Extensive noise studies show that physical conditions adjacent to highways, aircraft flight patterns and runways, rail lines, and other mobile circulation routes have a definite reflection on the qualitative and quantitative condition of noise. Further discussion will relate these noise studies to circulation patterns and mobile noise sources that are now existing in Tulare County.

C. Highways

Highway vehicles are unique noise makers. They have the ability to travel at varying speeds; they can traverse great distances and a myriad of topography types; they can signal each other audibly, and they have the braking mechanisms to make abrupt stops. These characteristics have been a major contributing force in the rationale for local, State and Federal governments in initiating regulatory measures towards noise abatement.

The simplest highway condition for measuring noise levels is the indefinitely long, straight highway corridor. For this particular example of noise prediction, the "Nomograph for Approximate Prediction of Highway Noise Levels"¹ is utilized. Strict application of this procedure is limited to continuous, freely flowing traffic. No physical barriers that could attenuate sound readings are considered in these figures.

Ideal highway conditions are not always available for noise measurement. Factors such as barriers, pavement conditions, and slope gradients of a particular highway are additional variables that alter noise measurements, both in a positive and negative direction. Barrier attenuation is the amount of reduced noise achieved by walls, berms, vegetation, depressed highway or other forms of noise shields which may diffract sound waves when traveling from source to receiver. Vegetation may reduce highway noise to a certain degree. Width of vegetation, type of plants, and planting patterns affect the degree of noise reduction, not only physically but psychologically. Dense vegetation along a highway not only reduces highway noise, but screens it from view, making it more acceptable to the urban environment. Trees or vegetation alone though do not provide enough sound reduction. For a 100 ft. width of trees along a highway these noise reductions could be expected:²

distance 150 ft..... 5 db(A)
distance 200 ft..... 8 db(A)
distance 275 ft.....10 db(A)

Consider a highway that is depressed using retaining walls instead of an open cut. An observer standing back from one retaining wall might benefit as a result of the highway being depressed. But an observer on the opposite side of the highway may get higher than normal noise levels. Reason? Reflection, and even amplification, of highway sound off the retaining wall. Determination of barrier attenuation is dependent upon two factors: barrier height and the segment length of the road not completely shielded by the barrier. For example, a 15' barrier will reduce noise 15 db(A) at 475' from the source of noise, other variables being constant.

A study of Baltimore highways² has uncovered some interesting facts on noise and its relation to circulation routes and motor vehicles.

. Distance from highway - Consider a highway on level ground with 6,000 vehicles/hr. each traveling at 60 mph. With no attenuation in between, the following noise levels can be expected at these distances from the edge of the roadway:

100 ft. 71 db(A)
200 ft. 67 db(A)
500 ft. 62 db(A)

. Vehicle speed - Noise produced by automobiles increased dramatically with speed. But for trucks, there is practically no increase. With level ground, an observer 100 ft. from the edge of the road can expect these noise levels:

single car at 20 mph.50 db(A)
single car at 40 mph.58 db(A)
single car at 60 mph.64 db(A)
single truck at 25 mph. . . .76 db(A)
single truck at 50 mph. . . .76 db(A)

. Traffic volume - For level ground and a speed of 60 mph, the noise levels for various traffic volumes, as measured at a point 100 ft. from the edge of the travel lane, are:

single car. 64 db(A)
2,000 vehicles/hr 66 db(A)
6,000 vehicles/hr 71 db(A)

. Depression or elevation of roadway - Elevating or depressing a highway reduces noise at points immediately adjacent to the road (i.e. 100 ft.). And for a depressed section, you get continued noise reduction or distances greater than 100 ft. At 500 ft. though, an elevated highway produces almost the same noise level as a highway at grade. For a highway carrying 6,000 vehicles/hr. each traveling at 60 mph, you get these noise levels at 100 ft:

level-ground road.71 db(A)
hwy depressed 20 ft. . . .58 db(A)
hwy elevated 20 ft.. . . .60 db(A)

And at a point 500 ft. from the road's edge, these noise levels:

level-ground road.62 db(A)
hwy depressed 20 ft. . . .47 db(A)
hwy elevated 20 ft.. . . .59 db(A)

. Road texture - A very smooth road surface, like seal-coated asphalt, can reduce noise levels by 5 decibels compared to an average asphalt or concrete surface. An extremely rough surface, like gravel or slag or grooved concrete, can boost noise levels 5 decibels.

. Steepness of grade - Another factor that contributes significantly to highway noise is large trucks climbing steep grades. For grades of 2% or less, the increase in noise over level operation is insignificant. But for grades greater than 2% here are the expected increases in noise at the source:

3-4% grade.2 db(A)
5-6% grade.3 db(A)
7% or greater5 db(A)

The type, number, and speed of highway vehicles can also be equated to varying patterns of noise generation. Noise emissions for trucks, as estimated by the Federal Highway Administration, average 82 db(A) at normal operating conditions and 87 db(A) for accelerating trucks. Cars have an average operating noise level of 70 db(A) or 20 times less loud than a truck. Increased noise is generally in direct proportion to increased speed and traffic volume. Knowing the maximum speed limit, traffic volumes and truck percentages, CALTRANS formulated specific

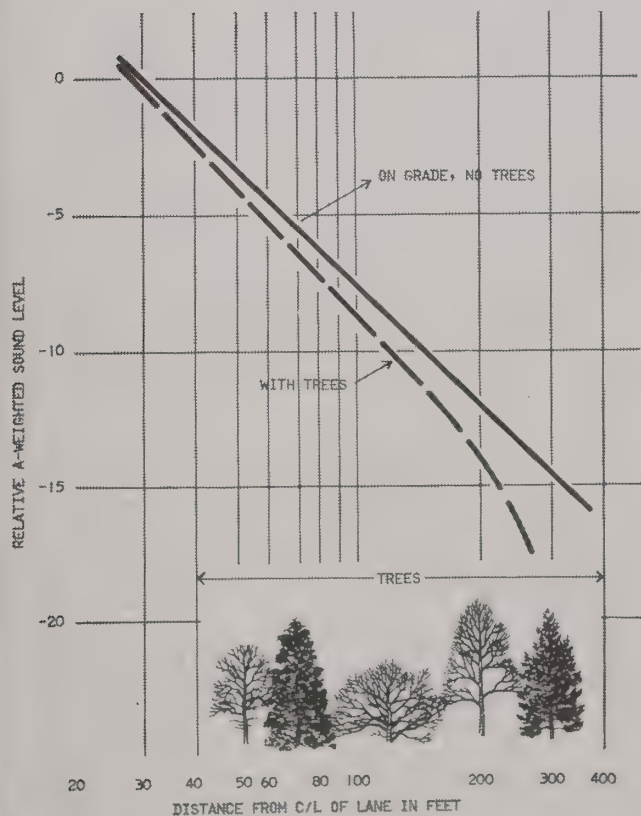
formulas for noise measurement on state highways.

D. L₁₀ Derivations For State Highways In Tulare County (see Appendix C)

There are many discrepancies in the techniques utilized for highway noise measurement. Duration of measurements and types of unit measurement are two factors that vary from agency to agency. In Tulare County, CALTRANS uses a specific measuring technique called "L₁₀ Readings." These readings are based on decibel levels that are assumed to exceed 10% of the measured time. As an example L₁₀ - 70 db(A) means the noise level is most likely to be greater than 70 decibels, 10% of the measured time. A useful tool in deriving L₁₀ readings is the nomograph. This graph enables one, by the aid of a straight-edge, to read off the value of a dependent variable when the values of two or more independent variables are given.

FIGURE 5

NOISE REDUCTION WITH AND WITHOUT TREES

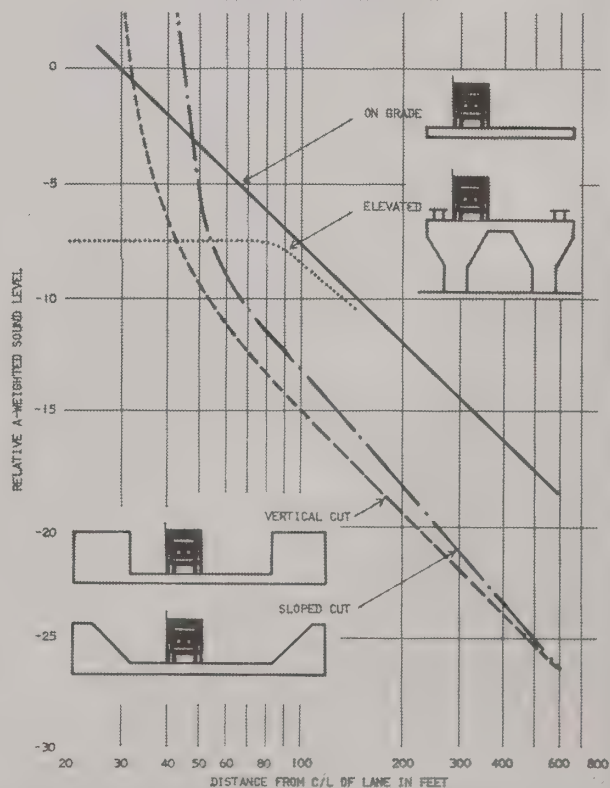


GRAPHICS BY TULARE COUNTY PLANNING DEPARTMENT

SOURCE: USDOT
TRANSPORTATION NOISE AND ITS CONTROL

FIGURE 6

NOISE REDUCTION PRODUCED BY VARIOUS HIGHWAY CONFIGURATIONS

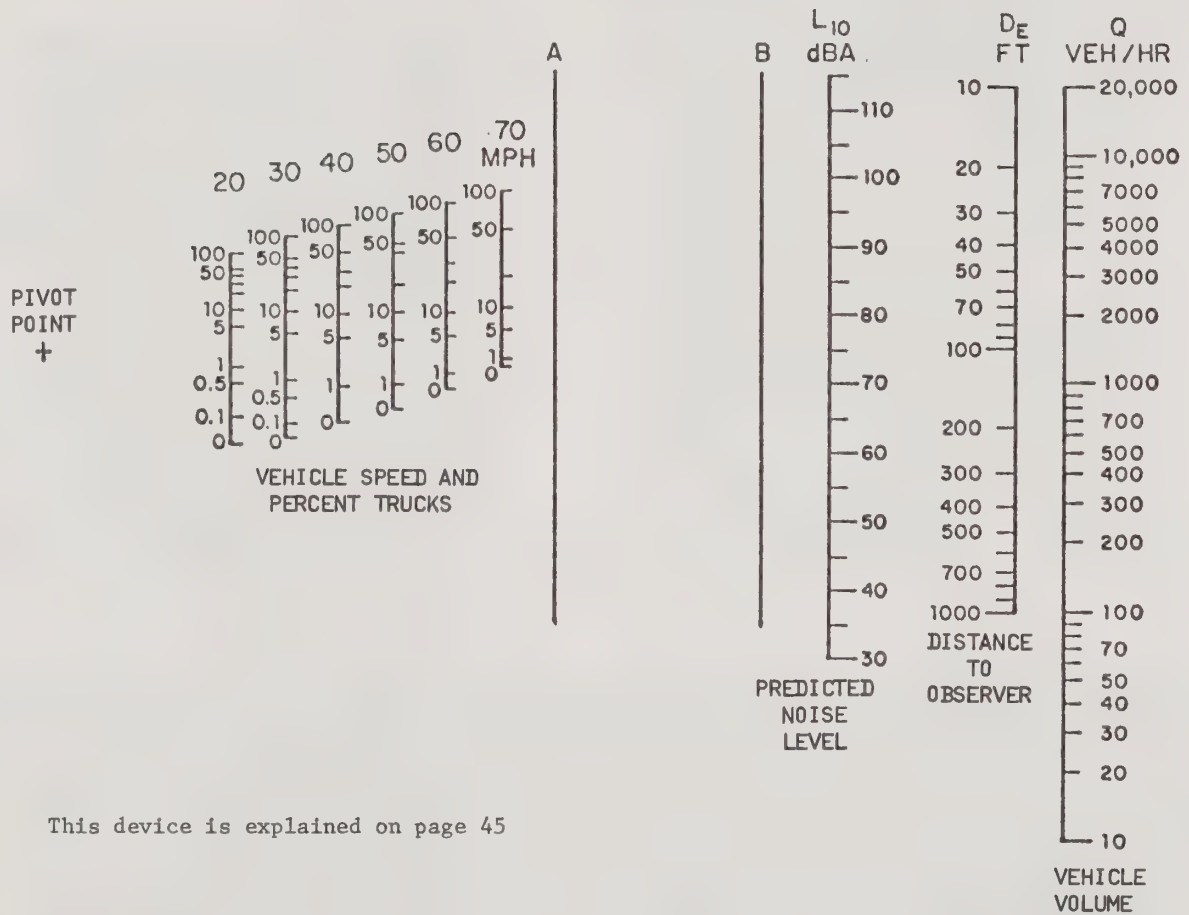


GRAPHICS BY TULARE COUNTY PLANNING DEPARTMENT

SOURCE: USDOT
TRANSPORTATION NOISE AND ITS CONTROL

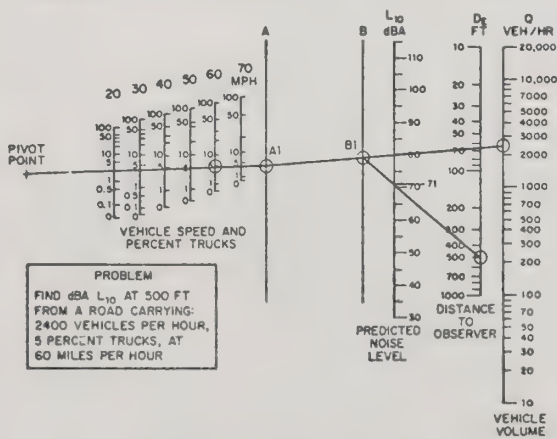
FIGURE 7

NOMOGRAPH FOR APPROXIMATE PREDICTION OF HIGHWAY NOISE LEVELS

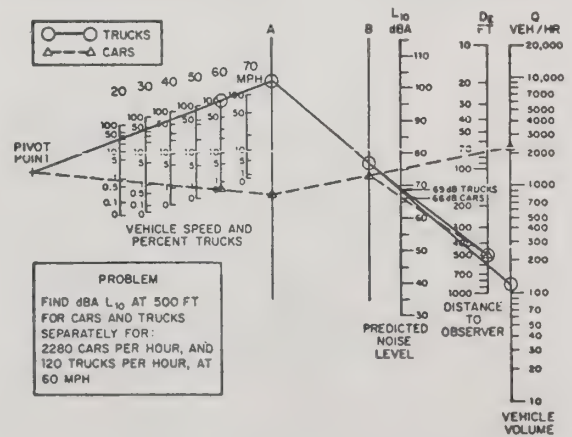


This device is explained on page 45

NOMOGRAPH EXAMPLE PROBLEM: CARS & TRUCKS TOGETHER



NOMOGRAPH EXAMPLE PROBLEM: CARS & TRUCKS SEPARATELY



The following information is the procedure by which to calculate noise contours. It should be noted that no additional weight is given to night time noise levels as in the L_{dn} procedure presently being considered by the Federal Highway Works Administration (FHWA) which assigns different weighting to day and night noise.

The use of the nomograph may be explained through the following example shown below for an observer 500 feet from an infinite highway carrying 2400 vehicles per hour with 5% trucks traveling at a speed of 60 mph:

1. Draw a straight line from the left pivot point on the nomograph through the "5%" truck point on the "60 mph" line. Extend the straight line to the Turning Line A. In this example, the intersection is marked "A-1."
2. Draw a second straight line from the intersection point A-1 to 2400 veh/hr. on the vehicle volume line and note the intersection, B-1, of this line with the vertical line B.
3. Draw a third line from point B-1 to 500 feet on the "Distance to Observer" line. The intersection of this third line with the vertical line between marks the predicted A-weighted, 10-percentile noise level, or L_{10} reading. For this example problem, the predicted noise level is 71 db(A) L_{10} .

The nomograph method is particularly convenient in developing noise contours, since the distance corresponding to any desired noise level can be found simply by pivoting this third line about the point B-1. For this example, noise contour line distances corresponding to 5 decibel steps would be:

contour line,

$$L_{10} \text{ db(A)} = 85 \quad 80 \quad 75 \quad 70$$

distance, feet = 22 65 190 590

L_{10} contours were provided by CALTRANS for the following State highways in Tulare County: 63, 65, 137, 190, 198, 201, 216, and 245. These contour lines are in 5 db(A) increments, ranging from 65 to 80 db(A). Measurements were "peak hour" estimates and assumed no attenuation.

Contours were extended 1000' from the centerline of the nearest lane, but were mapped at 200' from centerline of state highways and 100' from county roads (Plate I). In areas adjacent to the above mentioned highways and containing critical land uses (i.e., hospitals, rest homes, and parks) field analysis may be required to determine more precise noise levels.

These contour lines for the state highways could be projected into the future by using the nomograph chart. Although the nomograph calls for a known percentage of trucks, predictions of vehicle volumes can still be estimated. Trucks percentages could be estimated from the industrial and agricultural land use indicators located along particular highways. Speed limits would of course have a set value (CALTRANS uses 65 miles per hour).

E. County Roads and Noise Level Indicators

Existing traffic volumes for all County roads are listed in the publication "1973 Traffic Volumes." Traffic volumes are Annual Average Daily Traffic (AADT). AADT may be thought of as the total number of vehicles in both directions, passing a specific point on the highway, divided by 365 days.

Many hourly and seasonal variations occur on County roads, particularly during agricultural seasons. The variations are predicted by the use of controlling count stations. Control stations are selected roads that have the same general traffic characteristics as other roads in the area. These are then counted for a week long period every other month throughout the year.

Using this traffic volume data, plus estimated truck percentages (from manual counts by the Tulare County Public Works Department) and a 55 mph speed limit, estimates can be made as to the decibel rating for a particular County road. This procedure was accomplished in much the same way CALTRANS estimated L_{10} contours. The result is an estimated noise level.

These traffic counts are predicted for County roads only. Circulation noise within cities will require more complex analysis. These figures would be more difficult to compute because of: (1) heavier traffic volumes (2) attenuating factors (3) multiple noise sources and (4) background noise.

Future predictions of County traffic volumes are dependent on (1) increased population, (2) projected land uses for the region, (3) future plans for repaving and widening, and (4) plans for other transportation facilities in the area.

Tulare County has experienced a 2% increase in traffic volume from 1972 to 1973. This corresponds to an estimated 2.15% growth for Tulare County. This estimated increase in population seems to parallel increased traffic volumes. Future projection of decibel levels along highways can be estimated through past traffic data and direct correlations between future population projections.

To map each road and highway in the County using contours (estimated noise levels) at the regional scale, it is necessary to develop a graphic abbreviation system that can be used to portray possible problem areas where intervention may be necessary in the land use decision making process. This has been done for the County and state highways and is shown on (Plate I)

F. Other Mobile Noise Sources

Snowmobiles, boats and motorcycles represent different problems than that of cars and trucks. Where cars and trucks operate on designated circulation routes, the recreational vehicle can transcend water and snow, wilderness areas, and in many cases no designated routes at all. Riders of these machines are subjected to greater decibel levels than that of most standard vehicles of travel. Insignificant noise insulation and the rider's nearness to the engine provides for an environment that generates noise from 104 to 114 decibels.

Both the San Joaquin County Council of Governments and the Tulare County Planning Department Noise Surveys singled out the motorcycle as the "number one" noise polluter. Motorcycles can be divided into two types: street bikes and trail bikes. Trail bikes are a recreational vehicle and utilized on designated off-road or unpaved routes. Reasons for the motorcycles receiving the greater amount of complaints is probably due to the loudness of the machine - 111 decibels. In comparison with the automobile, the motorcycle is 10,000 times louder. The mini-bike, which is a smaller replica of the motorcycle, is another culprit of complaint responses. These smaller bikes not only operate on roads, but also in vacant lots, fields, and parking lots. Complaints received by the Sequoia National Forest Service are from backpackers relating to noise generated by trail bikes. Psychologically speaking, this may be a verbal resentment of the differences in expended energy to reach the same point

of destination. The Forest Service states that no significant noise problems have been connected to the use of snowmobiles within the forest boundary lines in Tulare County. The problem with snowmobiles is not with complaints of the non-riders, but with the danger to the riders themselves. An article in the Journal of Environmental Health (Nov/Dec 1971) said the following of snowmobiles and auditory problems:

The Committee on Conservation of Hearing, Collier Hearing and Speech Center, Dallas, Texas, reports that hearing protection should be considered whenever persons (1) have difficulty communicating by speech while they are in the noise, or (2) hear noises or ringing in their ears after being exposed to the noise for several hours, or (3) have temporary loss of hearing that has the effect of muffling speech and certain other sounds after several hours of exposure to the noise. According to the reports by snowmobilers, most riders have experienced at least one, if not all, of these symptoms.

The Kings River, Lake Success and Lake Kaweah represent areas for motorboat operations. Although water is a good conductor of sound, the seasonal (summer) and daytime use of these aquatic facilities makes the possibility of noise complaints unlikely. This lack of complaints is probably linked to the fact that residential development is virtually nonexistent around these water bodies and visitors usually anticipate some noise associated with the facilities.

G. Railroads

Noise problems from railroads accounted for about 7% of the noise complaints in the Noise Survey. The survey comments on train noise totaled 3.2%.

Trains are more predictable than motor vehicles, mainly because they have "set" time tables and they are of course restricted to a specific line of travel. One problem that the train has over the car is the "vibration" aspect. Vibrations felt by persons living in close proximity to a railroad are characterized by low noise frequencies. In the case of persons being subjected to these vibrations, the individuals often become adapted to the noise.

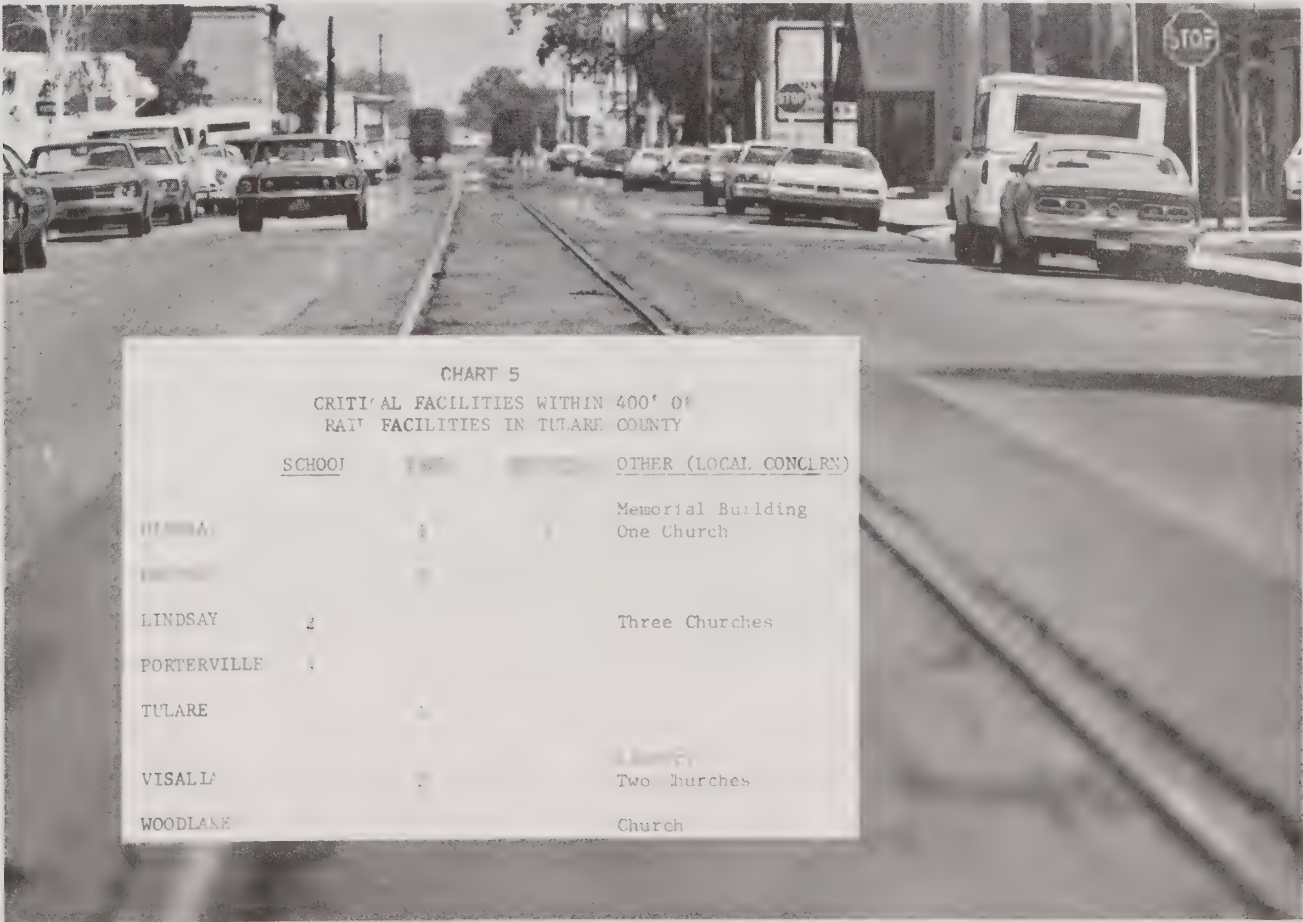
A complete land use study was undertaken as part of the railroad analysis in order to determine location of critical and sensitive land uses in the County. Data was obtained for use by cities and the critical facilities and areas where sizeable amounts of housing were located adjacent to railroads was mapped.

Future locations of schools, parks and rest homes, as well as subdivisions should be designed with noise and vibration situations being paramount in importance.

Critical facilities subject to noise from rail facilities or vibration were noted in the land use analysis. Critical facilities were tabulated by community and in relation to distance from centerline of rail corridors. The following table depicts areas within Tulare County where critical facilities should be considered for possible relocation or upgrading in

light of noise element findings. No facilities were noted in Tulare County unincorporated areas with the exception of two grade schools adjacent to U.S. Highway 99 that have been sound proofed and air conditioned by the California Transportation Agency. Land use was unavailable for Woodlake. The remaining cities had only a few cases of noise vs. critical facility problems needing additional in depth analysis before a final decision to relocate or sound proof structures would be necessary.

The County should give first priority to facilities found subject to unwarranted amounts of noise, near railroads and major County highways in first, a monitoring program to evaluate the actual/real problems confronted in using the critical facility, and second, in providing funds for noise attenuation where those funds are earmarked for such purposes.





Truck traffic on State Route 99, near Tulare. The height of exhaust stacks on trucks causes noise to "spill over" into areas adjacent to

the highway, even though the highway is depressed. Exhaust stacks are 13' in height, measured from ground level.

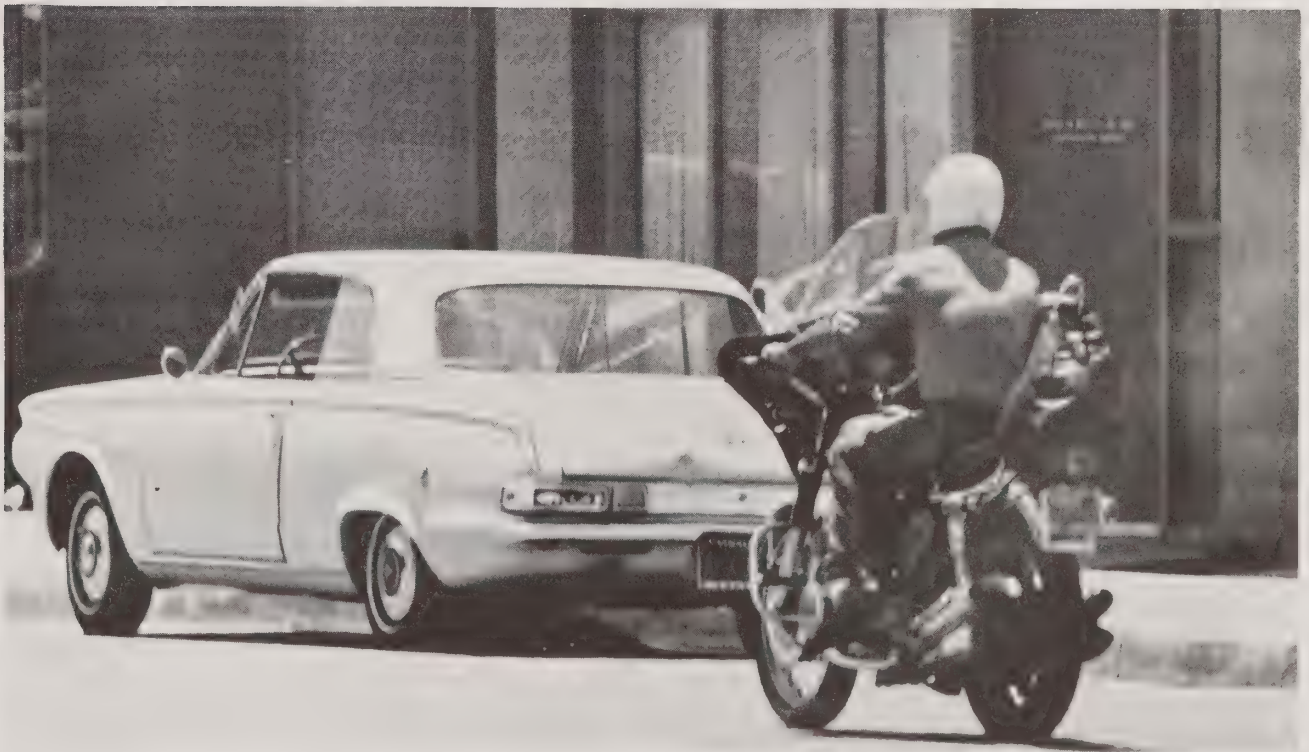
H. Transportation Noise and Land Use

To the urban or rural dweller, noise can be defined as any unnatural or unwanted sound. This definition is the basis for complaints of Tulare County residents and their comments relating to noise. The Tulare County Noise Survey, like so many other local, State, and Federal public opinion polls, has supported the fact that the major source of noise is transportation. This awareness has had some affect, in that many public agencies are now establishing acceptable noise levels for specific types of land uses and noise generating vehicles. The Federal Highway Works Administration (FHWA), via the Federal-Aid Highway Act of 1970, has adopted

the following policy:

"The Secretary, after consultation with appropriate Federal, State, and local officials, shall develop and promulgate standards for highway noise levels compatible with different land uses..."

The U. S. Department of Housing and Urban Development considers noise a threat to the serenity and quality of life in population centers. HUD has published departmental noise standards which prohibit HUD support to new construction on sites having unacceptable noise exposures.



Motorbikes and motorcycles are becoming more popular as recreation vehicles and means of transportation. This one has a good muffler

and is not as likely to produce "nuisance complaints" as one without a good muffler system.

I. Air Transportation Noise

In 1970 the Tulare County Planning Department completed an Airport Master Plan¹ which was instrumental in bringing about new airport improvements. The Federal Aviation Administration has provided substantial funds for the improvement of airport runways and facilities as a result of the need for funds that was evident upon completion of the Master Plan.

Although studies completed by the State and County substantiate the proposition that Tulare County will continue to maintain a relatively minor position in the regional air carrier market, it is important that noise be addressed principally in terms of the three leading airports that exist in the County, since these airports have been improved utilizing federal funds and therefore must be able to accept the loudest of aircraft, namely jets.

Upon examination of the noise survey data, projected airport demand in Tulare County and land use analysis around airports in the County, it is evident that the County and cities should maintain the low intensity of land uses that generally exist around the airports in Tulare County.

Chart 7 shows the relationship between airport operations, runway length, types of airport usage to be found at airports in Tulare County, and adjacent land use characteristics.

It is recommended that the Airport Master Plan be carried out as it now stands, with revisions as necessary in the near future due to changes in airport characteristics.

Noise should be only a minor consideration in the operation of airports in Tulare County, provided that land use intensity does not increase complaints and concern on the part of the overall community.

Several critical facilities exist within the flight pattern of the Visalia Airport including the Goshen School and a new park and recreation complex adjacent to the airport. Recommendations have been made to the city for shifting flight patterns to avoid disturbing the school environment and the park complex was publicly debated at length prior to its construction. The park complex consists of a golf course, public areas and rodeo grounds.

J. Conclusions

The analysis of contours and land use, as well as the opinion survey indicate that transportation noise is of greatest concern to the community, primarily from the standpoint of auto, truck and motorcycle noise.

Since the County has limited rail and air facilities, few complaints were received that indicated concern for noise in relation to air and rail facilities. Land use problems that exist are, on the whole, marginal in character.

Automobiles and trucks however, do create problems of noise that are resolvable through better design, better land use planning, stricter enforcement of codes and ordinances and greater concern on the part of community organizations for maintaining a high quality environment in Tulare County.

As more sophisticated data is required for analysis of noise related problems in both cities and the County unincorporated areas, it should be mandatory that all areas of critical concern in the County be continuously monitored in order to provide more logical solutions to noise problems. This will entail the allocation of equipment and manpower to deal with noise and its effects upon the health, safety and welfare of the community.

K. Recommendations

The County Board of Supervisors provide monitoring equipment and allocate sufficient staff to the County Health Officer in order to provide accurate and scientific data on a continuing basis to operating and planning departments within the County. This same service should be offered to cities and special districts where need for accurate information exists, on a contract basis.

The Public Works Director determine ways to better design or maintain highways and roads where noise is found to be significant.

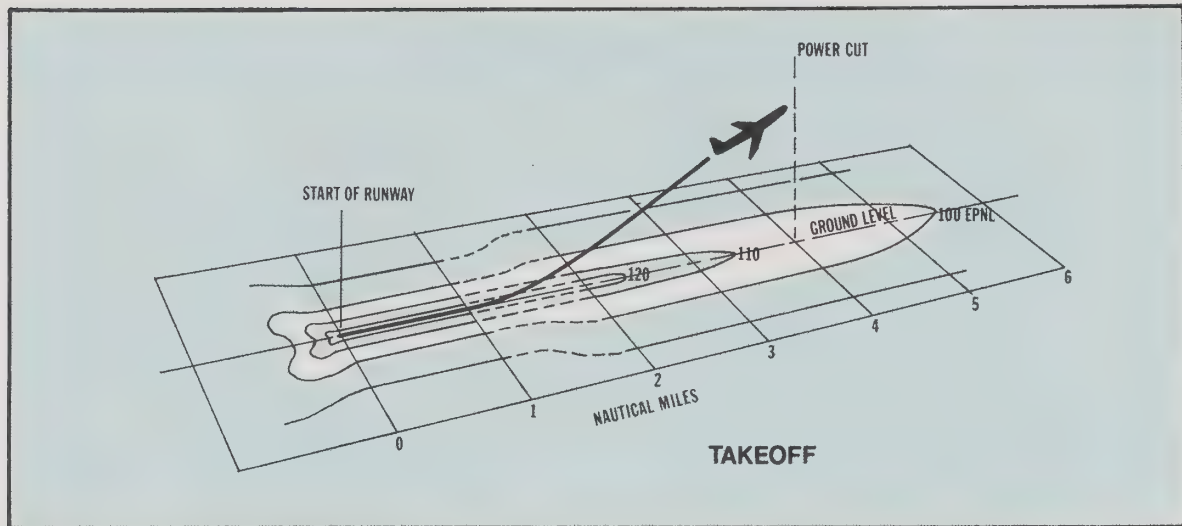
CHART 6
AIRPORT ANALYSIS

	Contour Map #	Operations Per Day	Operations Per Year ⁽¹⁾	Small	Jet	Runway	Radius of (4 miles ±) Land Use Comments
ALTA	I	Average of 5 per day Seasonal	15,000	X		3300'	Generally diverse agricultural land. Low density rural housing is mixed throughout the citrus groves. Live-stock pens and pasture are south of runway. East side agricultural land use containing several residences.
ECKERT	I	Average 5 to 25 Seasonal	14,500	X		2020'	Bordered on all sides with high value citrus groves.
GALLAGHER FIELD	I	-to 100 per day Seasonal	6,000	X		2555'	Located in agricultural land between Tulare and Visalia. Future development here may eventually conflict with aircraft.
GREEN ACRES	I	Average 25 per day Seasonal	18,000	X		2800'	Surrounded by agricultural land uses to North, East and West. Medium density residential land use to the south. Green Acres School is less than a mile to the east.
HARMON FIELD (PIXLEY)	I	Seasonal	10,000	X		2050'	Field crops, pasture and vacant land, sewage treatment plant on the west side of runway.
PORTERVILLE	III	Seasonal (fire and agricultural)	35,000 in '68	X	X	6000' 4000'	Three miles southwest of urban area, in agricultural land. Field crops, citrus, fruit crops and vacant land surround the airport. A new subdivision, Lake-side Development vicinity of runway 12.
SEQUOIA FIELD	I	Seasonal (fire and agricultural)	14,000	X		3050'	Surrounded by vacant agricultural land. A County Geriatrics Unit and Juvenile Detention Center are on airport grounds.
THREE RIVERS	I	Data not available	300	X		2000'	East of airport a strip of vacant land which runs along the base of the foothills. To the north is vacant land. Several residences exist in general area of runway 13 and a corral/rodeo arena complex. To the south is scattered commercial and low density residential land uses. Proposed school site approved by TCPA in 1970.
TULARE	IV	4 and up	20,000	X		3360'	Bordered by U.S. Highway 99, commercial land uses west and northwest. East and south are golf course, field crops, and pasture. Elk Bayou, a natural drainage channel, is located adjacent to the approach runway. Regional park complex has been proposed by T.C. that would surround the south and southwest portions of park.
VISALIA	II	200 during the week, more weekends	60,000	X	X	5895'	Intersection of two major highways. Highway 198 and U.S. 99, north and west. Pasture and row crops surround the airport. A new park complex was just built that is just 1/2 mile from airport. Also a rodeo arena and ranch complex to the east.
WOODLAKE	I	Data not available	18,000	X		3000'	Riverside Avenue: east of airport is bordered by low density, residential land use. West and north of field are crops, pasture and public land.

Source: TULARE COUNTY AIRPORT MASTER PLAN 1970,
AIRPORT AUTHORITIES AND T.C.P.D.

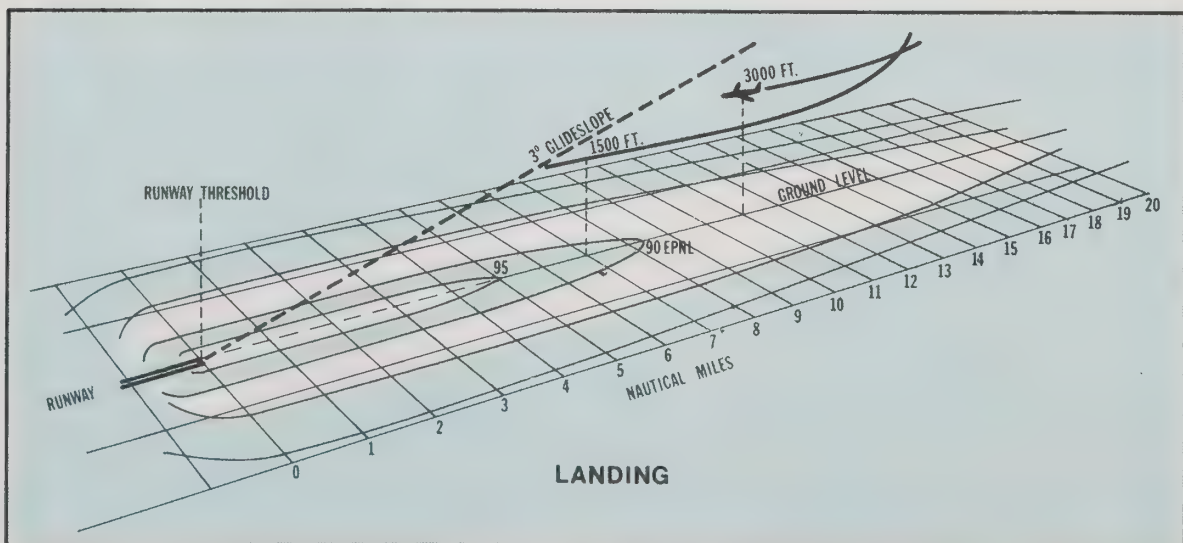
(1) Includes take offs and landings

AIRPORT FOOTPRINT PATTERNS



TAKEOFF NOISE ON THE GROUND. Aircraft use full power during takeoff and are therefore at their noisiest in this operation. Since the noise heard depends on both the intensity of sound at the source and the distance between the source and the listener, it is important for aircraft to reach sufficient altitude before crossing residential areas. The top portion of the attached diagram showing aircraft operational sound patterns depicts typical patterns of noise reaching the

ground during takeoff. At certain airports where residential communities are close to the runway, power outback can be initiated after the aircraft has reached a safe altitude in order to reduce the noise. This procedure, however, reduces the aircraft rate of climb and requires additional power over areas slightly farther away, thus exposing those areas to more noise than if the original rate of climb had been sustained.



Chapter Seven

Abatement and Implementation

CHAPTER VII

ABATEMENT AND IMPLEMENTATION

A. Introduction

Nuisance complaints stem from two problems. One, the fact that the mobile noise source exists and may exceed decibel limits that propagate complaints and two, the fact that there exist land uses in close enough proximity to these noise sources to warrant complaints. For instance, concentrations of residential development adjacent to a motorcycle track or a heavily traveled highway system would be specific examples of land use - noise incompatibilities. Tulare County is fortunate in that the severe noise problems which exist in the greater urban centers of California (i.e., Los Angeles, San Francisco, San Diego) are almost nonexistent in the rural portion of the County. On the other hand, noise is most noticeable to people not subjected to it constantly. Almost all responses were from urbanized areas in Tulare County. This, of course, would parallel the fact that traffic density is concentrated in the cities. To mitigate this problem cities can reduce a good portion of the incompatibilities of noise and land uses by appropriate zoning and attacking the problem at the source and path. Mitigating measures are discussed at greater length in other portions of this report.

For ease in listening, over 90% of the words spoken should be correctly heard.⁸ In a recently completed social survey, 71 db(A) was found to be a maximum acceptable level for background noise for voice communication. Above this level, people complained, or felt that they were less able to perform their jobs properly. Of these noise annoyance relationships, being awakened from sleep is probably the most undesirable response. Steinicke, in a study of 343 subjects found that noise stimulus equivalent to 60 decibels awoke all but 10% of those sleeping victims.⁸ Theissen reports that some levels as low as 40 to 45 decibels have a 10 to 20% probability of shifting the level of sleep for subjects picked at random.⁸ Some research on noise sleep relationships have been reported:

"The level of 35 decibels can be considered as a threshold for optimum sleeping conditions, since at this level it takes only 20 minutes to fall asleep and the period of sleep will last from 2 to 2-1/2 hours."

The Williams Committee report reaches a similar conclusion. In order to insure sleep, it recommends at night noise levels should not exceed 35 decibels, measured inside a dwelling unit.⁵⁷

Noise may stimulate a subtle, human physiological response that could be directly related to changes in blood vessel diameter, cardiovascular blood pressure and volume, heartbeat rate, respiration rate, pupil size, sweat gland activity, and endocrine gland excretions. These physiological responses begin to surface at 65 decibels. Stress response becomes more pronounced at 80 to 85 decibels.⁸ With scientifically derived decibel levels, specific recommendations referring to mobile noise sources can be developed. To assure that the publicly expressed noise complaints toward motorcycles, automobiles, trucks, and trains are answered, specific mitigating measures should be employed by the County of Tulare and respective cities to decrease noise levels. Recommendations on attenuation of mobile noise will involve noise reduction at three major points; the source of the noise, the path in which it travels, and the land use or persons receiving the noise.

B. Abatement At Source

Noise sources can be classified into two categories: stationary and mobile. Mobile noise sources are, for the most part, highway related motor vehicles; while stationary sources include various commercial and industrial uses. The major stationary noise generators are the ones that utilize large pieces of machinery that house numerous moving parts or employ a loud exhaust system. To alleviate or reduce these points of noise generation the following recommendations could be established:

1. *Replace metal gears with nylon or plastic types.*
2. *Pad vibrating metal housings with insulating material (rubber, asphalt, insulation material).*
3. *Lubricate moving machine parts.*
4. *Partially or completely enclose noisy machines.*
5. *Replace noisy machines with quieter ones (electrical motors).*
6. *Regulate specific operating hours for louder types of machines (8 AM to 5 PM).*
7. *Use of baffling structures at property line to reduce or disperse sound.*

Using these noise attenuation methods, noise reduction may range from 4 to 20 decibels, depending on the number of procedures employed. Noise within the industrial complex is regulated by the California State Occupational Safety and Health Act (CAL-OSHA). This agency determines absolute noise levels to which employees are to be subjected since it has responsibility for enforcement of regulations relating to manufacture of machinery and other products to insure safety.

Mobile noise sources, primarily automobile and truck traffic are regulated by State and Federal agencies as to their maximum operating noise levels. To further reduce these noise levels, circulation patterns, speed, and the quality and quantity of traffic can be adjusted so as to maintain or even reduce noise level counts. The following recommendations, if implemented, can decrease noise as much as 15 decibels as in the case of a depressed highway or 2 decibels by decreasing the speed limit each 5 mph. The following recommendations may be utilized for reduction of noise from mobile sources:²

1. *Improve road surfaces (widening, paving).*
2. *Reduce traffic speed in areas where sensitive land uses exist.*
3. *Reduce truck percentage or types on specific routes*
4. *Reduce traffic volume.*
5. *Incorporate depressed highways in highway planning and design.*

The criteria for standards related to mobile noise sources should be based on the direct effects of noise on speech, interference with sleep, and annoyance. Discussion of hearing damage and its relationship to mobile sources is not discussed, since ambient noise levels are not known to present a serious hazard in Tulare County; except, near Highway 99, where intervention on the part of CALTRANS has been successful in partially mitigating noise problems at two schools (Goshen and Mineral King). There is significant documentation on the relationship of noise levels to speech interference, sleep, and annoyance. The Tulare County Noise Survey is the most up-to-date source of information on noise annoyances. A review of this public survey document shows motorcycles leading with 71% of the complaint

responses. Other mobile sources include car and truck traffic with 46%, trains with 7%, and aircraft with 4%. Almost all responses were initiated from within urban or suburban centers. Because there were no measured decibel levels at which the complaint responses would have taken place, scientific data should be compiled to more specifically define decibel levels that generate nuisance complaints related to speech, sleep, and disturbance of work. Figure Three in Chapter II on decibel levels vs. complaints is indicative of the responses recorded in the survey in terms of their relative significance.

There are State and Federal regulations that involve specific decibel rating for motor vehicles and their subsequent noise level operation adjacent to specific types of land uses.

The California State Vehicle Code Sections 27150 - 27160 states:

"No person shall operate or offer for sale a car that exceeds 82 decibels traveling greater than 35 miles per hour at 50 feet or a motorcycle that exceeds 86 decibels traveling greater than 35 miles at 50 feet."

The California Department of Transportation (Streets and Highway Code, Section 216) is delegated to undertake specific action if:

"A noise level produced by the traffic on any state freeway is in excess of 50 decibels, as defined, within any public elementary or secondary classroom, library, or multi-purpose room constructed prior to the adoption of the freeway route and being used for the purpose for which it was constructed."

In addition to these State and Federal noise regulations, many municipalities have promoted noise ordinances dealing with subjects such as quiet zones, noise limits on new vehicles, excessive use of horns, and improper muffler systems. Using these State, Federal, and local regulations as basic noise criteria for establishing standards, recommendations for noise abatement from mobile sources are suggested:

1. *Enforcement of the California State Vehicle Code pertaining to decibel levels for automobiles, trucks, motorcycles, recreational vehicles, etc.*

2. *Excessive sounding of horns or other signal devices should be deemed as in violation of the County policy, especially at night.*

3. *Improper or excessively noisy mufflers should be deemed as in violation of the County noise policies.*

4. *Upon the posting of designated quiet zones, no mobile noise source should be allowed to make unnecessary noise in the vicinity of schools, hospitals, churches and passive recreation areas when occupied, including campgrounds.*

5. *With appropriate modifications, "The Quiet City Report," developed by the League of California Cities is recommended for consideration by the incorporated cities within Tulare County. (See appendix). The Tulare County Association of Governments should act as a catalyst in recommending standards to be used within Urban Area Boundaries that are consistent with city standards preferably on a county-wide basis.*

In addition to local noise regulations the Environmental Protection Agency and various car manufacturers have acted jointly to bring about reduction of community noise through research. For instance, using special tandem experimental mufflers on trucks can reduce the decibel level from 82 to 78. The noise output with no muffler under these conditions produces about 95 decibels. Another mitigating measure for truck noise is the use of the new rib design tires. Cars also fall into this same category in that updated and improved exhaust systems and quieter tire tread designs will in the future reduce the absolute amount of decibels.

From the above discussion it is evident that all levels of government and the private sector of the economy have a role to play in noise reduction if goals for a quieter environment are to be attained.

C. Abatement At Path

The path is defined as a line which noise waves travel from source to receiver. To properly attenuate noise, sound waves can be dissipated, absorbed, and reflected in a manner that screens the audible reception of the receiver from the source point (assuming that only one source is involved).

The U.S. National Park Service indicates that grass or ground cover on the sides of a depressed expressway embankment doubles the degree of sound reduction effected by paving on the same bank.⁵²

As efficient noise reducers, plants alone do not fall into this category. Aesthetically and psychologically, plants project a certain serenity to those persons viewing and living near the roadway.

Plants reduce unwanted noise by 7 decibels per 100-foot width of plantings. Bolt, Beranek, and Newman have expressed the following values for excess attenuation of landscaping per 100' of vegetation.¹⁵

.deciduous trees without leaves	-3 db(A)
.evergreen	-5 db(A)
.deciduous trees with leaves	8-9 db(A)

Recommendations for mitigating sound at the path are as follows:

1. Pavement specifications. Proper maintenance of existing roadways adjacent to residential development can decrease noise up to 5 decibels occurring on adjacent land uses.
2. Limitations on allowable grades. Grades greater than 2% have a significant effect on decibel increase due to trucks and cars shifting into lower gears and causing their engines to operate at higher (louder) rpm's. Locating residential development, hospitals, rest homes and schools adjacent to a grade may create disturbing or annoying conditions.
3. Use of depressed highways or roadways. For example, at distances of several hundred feet or more from the highway, the noise level from a depressed highway is 7 decibels lower than from a highway on grade.
4. Use of roadside barriers or berms. Use of these attenuating measures can have a significant effect on receiver point. The length, width, and height of these barriers will determine the amount of sound reduction. In many cases, a combination of barriers or berms and landscaping are the ideal noise attenuators in that they reduce noise and have an aesthetic and visually pleasing aspect both to persons traveling on the roadway and people living by the roadway. Baffled fences or walls can be very effective.

D. Abatement at Receiver

5. *Utilize distance or open space for noise reduction. The atmosphere is also an attenuating measure since sound waves are absorbed or reduced while traveling over a specified distance. For a single noise source (i.e., one car) noise will be reduced by 6 decibels every time the distance is doubled. In rural and urban areas, setback variances may be utilized as a measure to reduce the amount of sound a receiver experiences.*

This study is concerned with the path - a straight line-of-sight between the source and the receiver. Just as light is reduced or eliminated by placing an object in front of the source, so is the case with sound waves. The degree of attenuation depends upon: (1) the height and width of the barrier or object, (2) the mass of the barrier, (3) the configuration of the barrier or barriers, and (4) its relative location to the source and receiver.

Barriers such as concrete walls vary in cost and actual reduction capability.

Special aesthetic treatments (color, vegetation) would, of course, raise the initial cost. As far as actual noise abatement is concerned, concrete walls are probably the most efficient. They have a greater mass per unit volume than masonry, wood, or stucco. For each doubling of mass per unit area, the sound is reduced by 6 db(A).³¹ Vegetation can be planted next to the barrier to (1) shield the wall from passing motorists, (2) reduce diffraction of sound waves from bouncing off the barrier, and (3) combine with the wall barrier in reducing noise reaching the receiver.

Discontinuity of wall barriers can further reduce sound waves. Space between barriers causes acoustical impedance to sound-wave propagation thereby reducing sound transmission. For each doubling of air space (min. 2") sound intensity is reduced by approximately 5 db(A). Appendix C can be utilized to determine the degree of noise attenuation using acoustic barriers adjacent to highway systems.

The receiver is defined here as any person receiving sound waves from mobile noise sources. People are susceptible to specific reaction responses when certain decibel levels are experienced. For instance, 35 db(A) has proven to be a level above which sleep is difficult to acquire.⁶

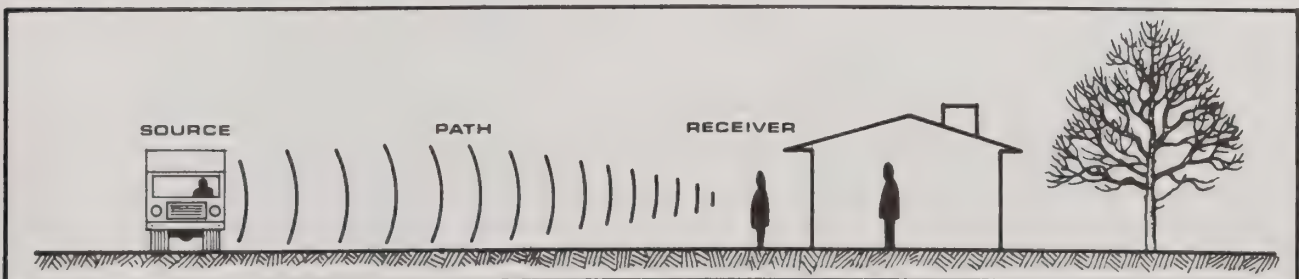
Seventy-one is a db(A) level at which communication between two persons within three feet of each other is difficult. These db(A) levels may also affect work efficiency.

Recommendations for noise receivers are as follows:⁸

1. *Future development should be planned to insure maximum separation between roadways and existing noise sensitive areas, particularly "critical facilities" and to make maximum use of shielding provided by natural barriers.*
2. *Provide for compatible use of land adjacent to heavily traveled highways.*
3. *Insure that existing noise sensitive land uses are properly buffered. This may include hospitals or schools, single family or multiple family residential units, or professional offices in which daily work tasks occur.*

Additional sets of recommendations for actual highway circulation patterns are suggested below:

1. *Control vehicular flows and volumes. These volumes and flows may have to be controlled to sufficiently reduce noise at specific areas that have sensitive land uses.*
2. *Limit access of certain vehicles to particular routes by time of day. This may include specified truck routes through specific areas of the city. It is recommended that these specified truck routes do not traverse residential areas.*
3. *Speed limits should be established and effectively monitored. Decibel levels generally increase with increasing speed. To properly reduce noise levels, reduction in speed may be necessary.*



Receiver may include persons, buildings in which persons reside, or animals. The most apparent means of attenuating noise from the receiver (person) standpoint, is to in some way arrange or insulate the building which he is occupying. The degree of noise buffering may depend on the person's function within the building. This may include living, working, recreation, health purposes, or education.

One study suggests that the more open and less enclosed a group of buildings are, the lower the noise level. This concept brings into play the reflective nature of sound waves and the need for architectural standards.³⁸

Other action that individuals can take to reduce noise levels on their own initiative are included in Appendix A.

E. Architectural Standards

Building materials, construction techniques, and the process of relating them to the physical nature of sound waves is the most efficient means of attenuating sound from entering the interior of a building.

The book, "Architectural Graphic Standards" by Ramsey and Sleeper (1970 edition) page 502 delves into the subject of building acoustics. The following general ideas are excerpts from this book on how to build an acoustically sound structure:

Noise is sound traveling in wave lengths. Their propagation requires a source and path; in the case of building structures the path will include building materials and air. The transmission of these sound waves is directly related to the mass of the building material, porosity, thickness, and method of construction.

Sound Transmission Class (STC) is a single figure rating that is used for comparing partitions, floors and other sound barriers found in buildings. It is a figure that displays the ability of the building material to restrict sound waves (decibels) traveling from source to receiver. An example of this concept can be expressed through this chart on wall materials and their ability to "keep out noise."

SOUND TRANSMISSION LOSS WALLS AND PARTITIONS OF MASONRY AND CONCRETE

BASE CONSTRUCTION		WEIGHT (lb/ft. ²)	STC RATING
Walls of Concrete Masonry Units	4" Lightweight	20	36
	4" Dense	30	38
	6" Lightweight	28	41
	6" Dense	43	43
	8" Lightweight	34	46
	8" Dense	55	48
	12" Lightweight	50	51
	12" Dense	80	53
Solid Brick Walls	4" Brick	38	41
	8" Brick	80	49
	12" Brick	120	54
Solid Concrete Walls	6" Reinforced Dense Concrete	75	46
	8" Reinforced Dense Concrete	95	51
	12" Reinforced Dense Concrete	145	56

Additional types of building material used specifically for acoustical design include applied plasters, fibrous matrices, lay-in panels, boards, and tiles. These materials are usually lightweight and porous. They do not prevent sound transmission; but they do have the ability to absorb sound waves into the many air pockets existing in the material.

Architectural standards and measurements for various parts of a building are suggested here.

As the STC Rating goes up, the less sound is likely to enter the building. Upon reviewing these charts remember that mass, porosity, and widths of space actually determine the eventual STC Rating.³¹

Windows and doors, in most cases are less able to insulate sound than the walls. Therefore, the number of openings is inversely proportional to the amount of sound penetrating the building interior. Normally, when window and door openings total more than one percent of the wall area, interior noise reduction will be no

more than 20 decibels, even if the remainder of the wall is such as to provide very high insulation. Walls that face objectionable sound sources should contain few, if any, openings unless specially designed to resist incoming sound. Since doors are weak noise reducers, the positioning in relation to noise sources is critical.

The difference between having the window "open" and having it "closed" has marked effects on noise entering a room. In Tulare County, the Goshen and Mineral King Schools exist adjacent to heavily traveled highway systems (198 and 99). The difference in open and closed windows is about 5-15 decibels, depending on the distance from the noise source, window size, etc. During the warmer months open windows are often needed to circulate fresh air and cool the room. Air conditioning has been installed in order to: (1) cool the room more efficiently; (2) reduce noise levels in the room because the windows could be kept closed; and (3) eliminate other structural modifications that may be needed to reduce noise.

SOUND TRANSMISSION LOSS - STUD FRAMED WALLS AND PARTITIONS

BASE CONSTRUCTION	WEIGHT (lb./ft ²)	STC RATING
1/4" Plywood - Nailed to Studs	2 1/2	24
1/2" Wood Fiberboard - Nailed to Studs	3 1/2	28
1/2" Gypsum Board - Nailed to Studs (Joints Taped and Sealed)	5 3/4	32
3/8" Gypsum Lath-Nailed to Studs - 1/2" Sanded Gypsum Plaster (2 Coats)	15	35
Metal Lath-Nailed to Studs - 7/8" Sanded Gypsum Plaster (3 Coats)	20	37
5/8" Gypsum Board-Screw Attachment to Studs (Joints Taped and Sealed)	6	39
3/8" Gypsum Lath-Clipped to Studs - 1/2" Sanded Gypsum Plaster (2 coats)	15	40
Metal Lath-Clipped to Studs - 3/4" Sanded Gypsum Plaster (3 Coats)	19	37

SOUND TRANSLATION LOSS AND IMPACT NOISE RATINGS - WOOD FRAMED FLOORS

BASE CONSTRUCTION	WEIGHT (lb./ft ²)	STC RATING
1/2" Plywood Subfloors and Standard Oak Flooring - Nailed to Joists	8	25
Ditto - Plus 5/8" Gypsum Board Ceiling Nailed to Underside of Joists	10	37
Ditto - Except 3/8" Gypsum Lath and 1/2" Sanded Plaster	15	39
Ditto - Except Metal Lath and 7/8" Sanded Gypsum Plaster (3 Coats)	17	39

SOLID SINGLE SHEET MATERIALS

Aluminum	0.025	.35	19
Plywood	1/4"	.73	22
Cellulose Fiberboard	1/2"	.75	22
Plate Glass	1/4"	3.2	26
Sheet Steel	18 Gage	2.0	30
Lead	1/16"	3.9	34

WINDOWS AND GLAZING

CONSTRUCTION	THICKNESS	WEIGHT (lbs./ft ²)	STC RATING
D. S. Glass	1/8"	1 1/2	21
Plate Glass	1/4"	3.2	26
Insulating Glass	1"	6 1/2	32
Laminated Acoustical Glass	9/32"	3 1/4	36
Glass Block	3 3/4"	20	40
Spaced Glass (1/4" - 2" Air Space 1/4")	2 1/2"	6 1/2	42

SOUND TRANSMISSION LOSS - STUDLESS AND SPECIAL DRYWALL CONSTRUCTION

CONSTRUCTION	WEIGHT (lbs./ft ²)	STC RATING
2" Panel, Sanded Gypsum Plaster on Metal Lath with or without Imbedded Channels	18	34
2 1/2" Panel, Sanded Gypsum Plaster on Separate Layers of Gypsum Lath	19	38
2 1/4" Solid Laminated Gypsum Board	10	30
5/8" Gypsum Board Layers Laminated to 1 5/8" x 6" Gypsum Strips	7	34
Double Solid Drywall - 2 Separate Wythes of 1/2" Gypsum Board Laminated to 1" Gypsum Board with 1 1/8" Air Space	14	46

DOORS*

Hollow Core Wood	1 3/4"	3 1/2	26
Solid Core Wood	1 3/4"	5	29
Hollow Metal	1 3/4"	5	30
Packed Metal	1 3/4"	7	32
Special Acoustical	1 3/4"	6	35
Solid Core Wood	2 1/4"	7	32
Special Acoustical	2 1/2"	8	38

* Fully gasketed, all edges and bottom. "Leaky" gaskets or no gaskets can reduce STC RATINGS by 5 to 15 points.

Source: Architectural Graphic Standards



THE FAIRGROUNDS IN THE CITY OF TULARE. Local business people complain about excessive noise and late night operations related to these races. The races are an important source of revenue to the District Fair Board, however.

This sets a classic noise problem which may not be fully resolved. Avoidance of placing incompatible uses of land next to each other is strongly recommended in this Noise Element, in order to avoid future problems in other places.



Close proximity of housing units to this busy arterial is partially corrected with walls and planting. Note that the traffic is pri-

marily automobiles rather than trucks, thus allowing for lower wall height.

Other modifications possible for reducing noise are as follows:

- . carpeting and padding to insulate the room, and prevent noise from coming through the floor
- . heavy drapes in front of windows for absorbing noise
- . insulate plenums and ducts with resilient material
- . arrange building spaces with noisy equipment and noisy activities together, away from quiet places
- . insulate openings and areas of leakage

An excellent example of architectural design where acoustics were a prominent consideration is University Hill Elementary School in Rochester, Michigan which was designed by Louis C. Kingscott & Associates of Kalamazoo, Michigan.

The design objectives were:

- . to permit a quality education
- . complement community values
- . open education concept
- . "child centered"

The sound reduction techniques included:

- . a depressed learning center
- . concrete block railing surrounding depressed learning center
- . carpeting
- . acoustic tile ceilings
- . baffled entrances
- . separation on noisy/quiet areas
- . minimum windows

The exterior walls are brick with concrete block back-up and concrete trim.

Examples of similar treatment to school and hospital sites in Tulare County would include the Veva Blunt Elementary School, the Allensworth School and the Kaweah Delta Hospital. The Veva Blunt Elementary School has an innovative concept for first grade students utilizing "learning centers" in an "open space plan" concept. Rooms are air conditioned and carpeted. The Allensworth School, although not subjected to excessive noise, is air conditioned, carpeted and educationally innovative in spatial layout.

The Kaweah Delta Hospital in Visalia, although located adjacent to Highway 198, is a self-contained and spatially innovative concept that uses space and architectural amenities to break up sound and provide a visually pleasing environment for patients.

Many of the critical facilities in Tulare County are gradually being modernized to reduce noise and provide at the same time, a more efficient and usable plant.

F. Distance As A Means of Abatement

Distance is a very important variable when dealing with noise. Noise reduction due to distance is governed by the inverse-square law. (Appendix E)

Sound attenuates at approximately 6 decibels per doubling of distance. This attenuation is assuming a field free of objects and related only to atmospheric reduction. Not only does the distance affect noise reduction, but also height. Building height affects the intensity of noise generated at street level.⁸

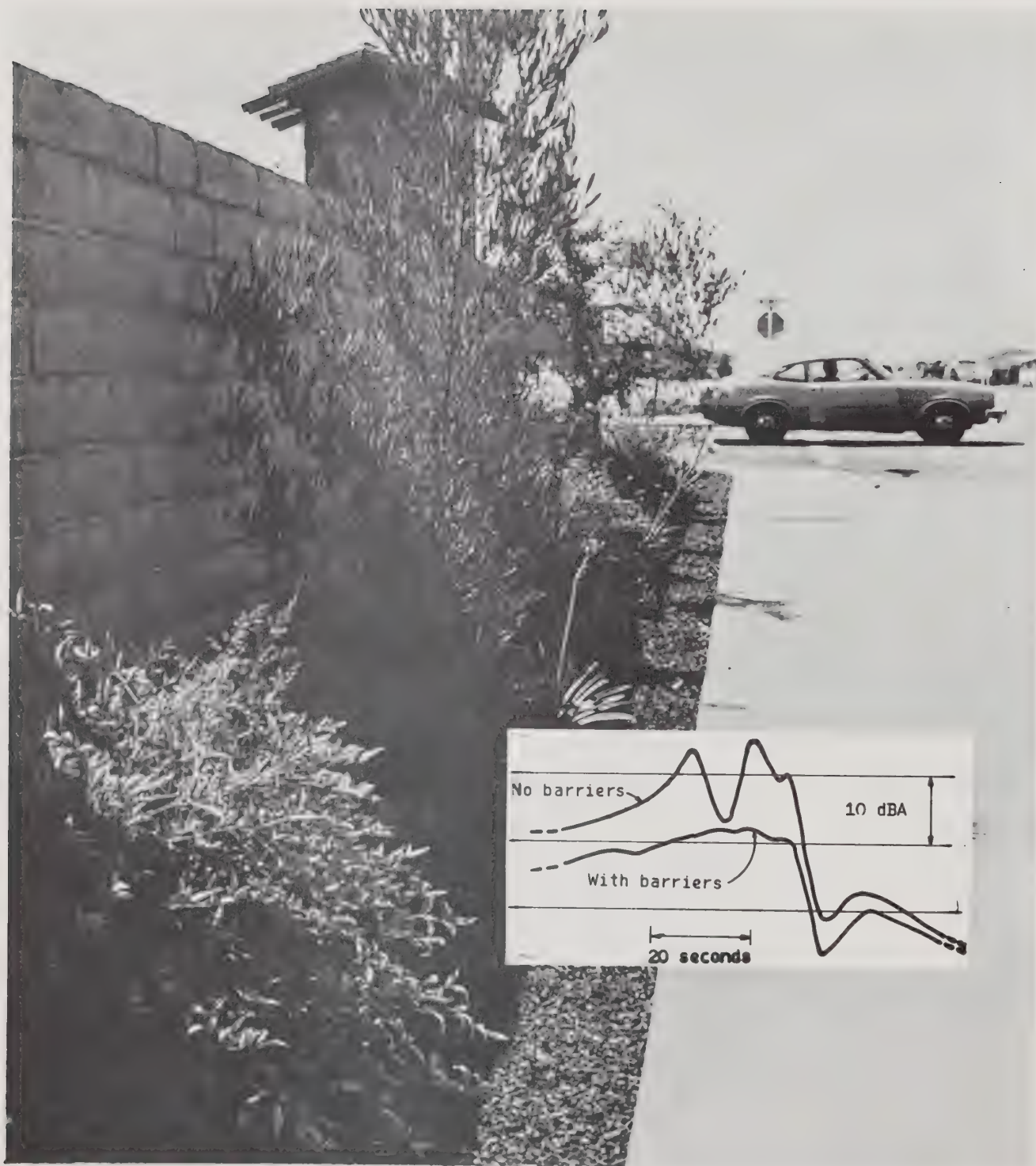
Noise Source	High 3-story	Medium 2-story	Low 1-story
bus	86 db(A)	85 db(A)	76 db(A)
truck	84 db(A)	82 db(A)	81 db(A)
auto	77 db(A)	77 db(A)	74 db(A)

*measured at 25 feet from noise source

Knowing this correlation between distance and noise reduction, recommendations can be set forth as to setback distances for various land uses, especially near heavily traveled highway systems. In an urban setting, because of reflective surfaces, the noise level does not diminish consistently by 6 decibels per doubling of distance.

The following values are horizontal measurements in an urban environment - Philadelphia⁸

	Horizontal distance from noise source in db(A)				
Noise Source	15 ft.	25 ft.	50 ft.	75 ft.	100 ft.
Train	-	92	85	85	83
Truck	87	81	76	74	
Bus	81	76	72	68	
Auto	78	74	65	63	



This five foot wide planting strip and block wall are effective noise reducers for this subdivision.

G. Additional Land Use & Transportation Recommendations

Because rail lines within the urban and rural areas of Tulare County are established and time tables for trains are established to benefit the community at large, mitigating measures for noise reduction from these modes of travel are limited. Cities within Tulare County that have rail systems entering their boundaries may enact an ordinance to reduce rail traffic so that at specified periods of the day sleep will not be disturbed and annoyances or working conditions will not be disrupted.

Sensitive land uses should not be located adjacent to or near rail lines which would essentially create a situation where complaints would occur. Where existing critical facilities are established near to or adjacent to rail lines, proper attenuating measures should be proposed so as to sufficiently reduce noise levels to acceptable proportions. Attenuating measures such as structural modification would be needed in cases where critical facilities are located near rail lines. The number of trains per day/night, amount of vibration that results adjacent to land uses, and the kind of railroad activity would be variables to consider in evaluating the need for attenuation techniques.

The number of trains during nighttime hours would be more significant than during daytime hours since they would interfere with sleep.

Vibration may be dampened by sandy soils and enhanced and carried further by dense soils (clay). Continuous rails vs. jointed rails can help to cut down the "clickity clack" of rail traffic.

The kind of railroad activity has a more significant bearing upon level of noise complaints than possibly any other factor. Rail yards, where switching operations are taking place, have a tendency to generate noise that is often high pitched and during nighttime hours the high pitched noise of the rail yard as trains are assembled can be a difficult problem for a community to deal with strictly on the basis of noise, particularly when the economy of the community is dependent on rail facilities for its industrial base.

Within Tulare County, most communities are faced with night switching operations on a minimal and seasonal basis only.

Eventually, rail noise must be eliminated at its source - namely in the manufacturing plant. Newer trains and equipment should be less noisy if Environmental Protection Agency studies can point to significant ways to reduce noise and industry can develop train parts that are quieter.

Aircraft noise is again minimal and seasonal in Tulare County and is a necessary ingredient to the functioning of the economy and maintenance of the environment in many ways. Land use recommendations and aircraft/airport analysis for Tulare County are contained in Chapter VI.

H. Conclusions & Procedures for Abatement

Abatement of noise can be handled in a relatively simple and pragmatic manner. The above discussion has primarily examined techniques on ways to reduce noise at various source, path and receiver points. Employing the various attenuating methods, a procedural sketch of how to reduce a noise problem can be formulated for government agencies.

-IS THERE A NOISE PROBLEM?

- . Does the noise level cause a high percentage of nuisance complaints?
- . Does the noise exceed decibel level standards for the local community as specified by an ordinance?
- . Does the noise level conflict with State or Federal noise regulations?
- . Does the noise level generate conflicts with health, educational, or recreational functions?

-DETERMINE THE NOISE SOURCE AND DECIBEL LEVEL

- . For stationary noise sources examine machinery parts
- . Decibel levels can be determined by precise noise measurements using noise meters.
- . For mobile noise sources that have been properly calibrated before and after measuring, use accepted mathematical computations based on the nomograph or more specific measurements for actual field readings.

-DETERMINE AT WHAT POINT OR POINTS THE NOISE CAN BE ATTENUATED

- . Initially the abatement of the noise should occur at the source of the sound.
- . Costs, lack of policing powers or legislation, etc. may force whoever is concerned with the noise to attack it at the path or receiver points.

-WHAT METHODS WILL BE USED?

- . While it is important to consider efficiency in attenuating noise at the source, along the path, and at the receiver, it is nevertheless hoped that additional consideration be given to aesthetic values as well.

For example, though singularly unattractive, a concrete block wall six feet high is probably the most efficient noise barrier. However, with the addition of landscaping on one or both sides, not only are aesthetic values enhanced, but property values are increased as well. Furthermore, the vegetation acts to filter out particulate matter and absorb several vehicle emissions, i.e., carbon dioxide, carbon monoxide, and nitrogen dioxide, among others.

- . Efficiency and cost will usually determine method of abatement.

-WHO WILL BE RESPONSIBLE FOR REDUCING THE NOISE?

- . In most cases the person or persons responsible for the noise source.
- . In the case of mobile noise sources, it depends on whether the roadway or the land use was there first. In the case of a new freeway, CALTRANS would be responsible for reducing noise that could be experienced by nearby residents. On the other hand, locating a hotel next to a freeway should be the responsibility of the hotel owner.
- . Other agencies may be responsible for specific critical facilities - schools, hospitals, rest homes, libraries, etc. particularly if they are not yet constructed.

Generally, the person or persons responsible for the noise source should bear the burden of attenuating the noise. The Federal Government has set specific noise standards for motor vehicles and housing projects affiliated with HUD and where federal funds are being used. The State of California, and more specifically CALTRANS, has established noise levels for critical facilities (hospitals, schools, etc.) existing adjacent to state highway systems. On the local level excess noise may result in "nuisance complaints" or a charge of "disturbance of

the peace." Legislation at the local level should adopt the following premise of, "those persons responsible for the noise should bear the cost of reducing or eliminating the problem." This, of course, must come about through proper ordinance administration and use of police powers.

-WHY SHOULD IT BE REDUCED?

Unwanted sound is a facet of our highly technological society that has grown to be a very difficult problem to deal with. In Tulare County, this problem has not reached the "severity level," however, there are isolated cases where noise may disturb the daily function of education, communication or the health and welfare of the citizenry of the County. If this problem can be alleviated with simple technical methods and proper legislation, then everyone will benefit.

I. Implementation of Noise Standards

Noise Program. - Community noise is a subject of genuine concern to all. It is important that the County make a concerted effort to establish a program of community noise monitoring in Tulare County and that we endeavor to bring about changes in State and local regulations to implement a program of community noise control.

Revised Standards in Building and Health Codes. - In an effort to more effectively insulate structures against high levels of noise, the section of the 1973 Building Code pertaining to noise insulation should be adopted and expanded to include single family residential dwellings.

Noise Ordinance. - A noise ordinance should be developed and enforced by the Health Department to effectively protect the residents of the County from the ill effects of exposure to high levels of noise.

Monitoring and Field Sampling Noise Sources. - The Health Department currently has the expertise to begin a comprehensive program of monitoring noise levels in the County. The necessary time and equipment should be made available to the Health Department so they can begin to establish a data base that will make the development of a noise ordinance that is sensitive to the needs of the County possible. In order to do so, it is most important that the County concentrate on the development of a monitoring and evaluation system that can aid not only the Health Department and Planning Department in solving noise problems, but in addition, assist the Building and Public Works Departments as well as local cities who require precise information for evaluation of conditions necessary to meet Federal, State and local laws.

Chapter Eight Plan Update

CHAPTER VIII

PLAN UPDATE

A. Introduction

The Noise Element, being only one part of the General Plan Program, should be reviewed every two years and updated every five years. Circumstances may necessitate that the Noise Element be updated for other reasons as discussed below.

B. Necessity for Plan Update

The Planning Departments may find it necessary to make modifications to the Noise Element due to:

- . changes in the laws governing noise and noise control
- . extremely rapid growth patterns or changes in development activity
- . ordinance revisions
- . environmental impact reporting procedures
- . changes in General Plan Elements
- . a breakthrough in technology
- . excessive numbers of complaints being received on a broad scale that would necessitate changes in policy or administrative procedures

Finally, it should be noted that all General Plan Elements are formulated upon a

data base that, if altered or changed, requires a reevaluation of objectives.

C. Recommendations


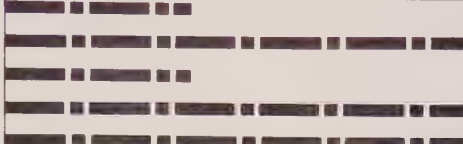


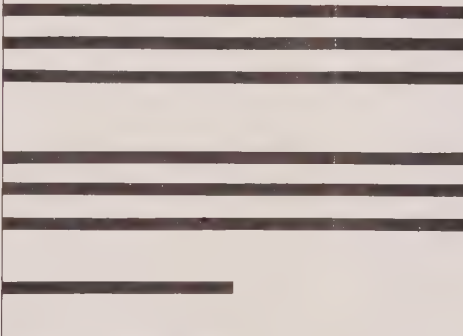

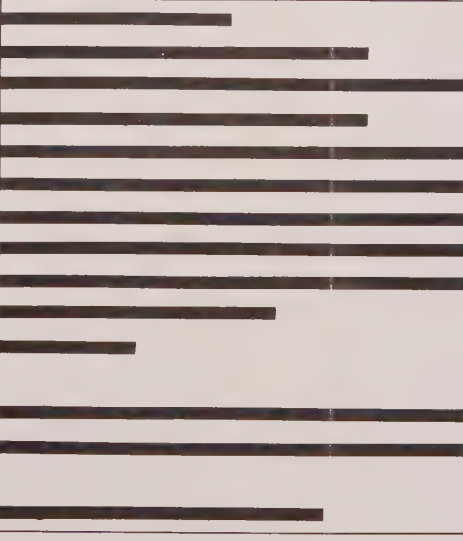

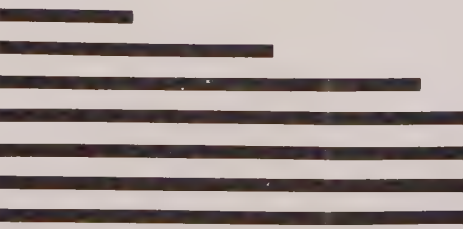
With the establishment of a Noise Control Office within the California State Department of Health (under authority of the California Noise Control Act of 1973) it may eventually be possible to establish more adequate and complete guidelines for preparation of Noise Elements. The definition of precise roles of the various levels of government in planning and implementation of noise standards is an immediate problem that the Noise Control Office should undertake in conjunction with local government.

State and local governments should work together in an effort to make certain that noise measurement techniques and procedures are more uniformly standardized throughout California

It is recommended that the Noise Element be reviewed every two years and updated every five years; or as necessity dictates when the assumptions under which this element was prepared are determined to be no longer appropriate.

The adjacent chart showing typical noise reduction methods is related to the discussion regarding abatement or reduction of noise at source, path, receiver and using distance. These are not standards, but instead are intended to give a reasonable picture of results that can be expected when noise abatement techniques are applied.

TYPICAL NOISE REDUCTION METHODS

POINT OF ABATEMENT APPLICATION	METHOD OF ABATEMENT	TEXT REFERENCE	TYPICAL DECIBEL REDUCTION RATE (DBA)			
SOURCE 	STATIONARY <ul style="list-style-type: none"> REPLACE METAL GEARS WITH NYLON OR PLASTIC INSULATE VIBRATING METAL HOUSINGS WITH INSULATING MATERIAL LUBRICATE MOVING MACHINE PARTS PARTIALLY OR COMPLETELY ENCLOSE NOISY MACHINES REPLACE NOISY MACHINES WITH "QUIETER" ONES 	CHAPTER VII-B				
	MOBILE <ul style="list-style-type: none"> ROAD SURFACE REPAIRS (HIGHWAYS) REPLACE BOLTED RAIL WITH WELDED SECTIONS (TRAINS) REDUCE TRAFFIC SPEED - *2DBA EVERY 5MPH AT 100' REDUCE TRUCK PERCENTAGE - 5% REDUCTION REDUCE TRAFFIC VOLUME - 2DBA EVERY 125 VEH/HR AT 55 MPH AT 100' INCORPORATE DEPRESSED* HIGHWAY 100' (6000 VEH/HR AT 60 MPH) 500' <p>*DBA - DECIBELS *20' DEPRESSED HIGHWAY</p>	CHAPTER VI-C CHAPTER VI-C CHAPTER VII-G				
PATH 	BARRIERS <ul style="list-style-type: none"> BARRIERS ON TOP OF SLOPES OF DEPRESSED HIGHWAY (20'), 50' FROM CENTERLINE OF NEAREST LANE AND 100' FROM RECEIVER TO BARRIER <ul style="list-style-type: none"> 3' BARRIER 5' BARRIER 7' BARRIER BARRIERS ON GROUND LEVEL, 25' FROM CENTERLINE OF NEAREST LANE AND 75' FROM RECEIVER TO BARRIER <ul style="list-style-type: none"> 3' BARRIER 5' BARRIER 7' BARRIER DISCONTINUITY OF WALL BARRIERS CAN REDUCE SOUND BY 5DBA FOR EACH DOUBLING OF AIR SPACE (MIN. 2") FOR EACH DOUBLING OF MASS PER UNIT AREA OF WALL BARRIER - 6DBA REDUCTION 	CHAPTER VI				
	PATH <ul style="list-style-type: none"> DENSE LANDSCAPING REDUCES UNWANTED NOISE BY 7 DBA PER 100' 	CHAPTER VII-C				
RECEIVER 	WALLS <ul style="list-style-type: none"> FILLING PLASTER WALLS WITH SOUND-ABSORBING VERMICULITE NAILING RESILIENT CLIPS TO STUDS AND INSERTING LATH ATTACH SOUND-DEADENING BOARD TO STUDS (BASE *STC=33) STAGGERED STUDS (BASE STC = 33) DIVIDING WALL INTO SEPARATE WYTHES WITH 4" AIR SPACE (BASE STC = 36) WINDOWS <ul style="list-style-type: none"> INSULATING GLASS (BASE STC = 21) SPACED GLASS (BASE STC = 21) DOORS <ul style="list-style-type: none"> ACOUSTICAL WINDOW UNITS FRAMED IN ALUMINUM SPECIAL ACOUSTICAL DOOR (2 1/2", STC = 26 BASE) SOLID CORE WOOD (2 1/2", STC BASE = 26) SOLID CORE WOOD (1 3/4", STC BASE = 26) FLOORS AND CEILINGS <ul style="list-style-type: none"> STAGGERED-JOIST CONSTRUCTION (FLOOR AND CEILING ARE SUPPORTED BY THEIR OWN JOISTS - STC BASE = 37) CEILING IS SUSPENDED FROM SPRING CLIPS (STC BASE = 37) RESILIENT DAMPING BOARD BETWEEN SUBFLOOR AND FINISHED FLOOR (STC BASE = 37) <p>*STC - SOUND TRANSMISSION CLASS</p>	CHAPTER VII-D CHAPTER VII-E				
DISTANCE  <i>Sound attenuates at 6DBA per doubling of distance, assuming a field free of objects and related only to atmospheric reduction</i>	<ul style="list-style-type: none"> SETBACK FROM NOISE SOURCE <ul style="list-style-type: none"> * 50' 75' 100' 150' 200' 250' 400' 800' *AT 50' DBA IS 86 	CHAPTER VII-F				

Appendix

APPENDIX A
HOW TO REDUCE NOISE IN AND AROUND THE HOME

SOME WAYS THAT INDIVIDUALS CAN HELP TO REDUCE NOISE AND PROTECT THEIR HEALTH

AT HOME.....

1. Make sure that homes are well insulated. This will not only reduce noise entering homes, but will also help to reduce heating and cooling costs.
2. Keeping windows closed. Adding storm windows and using air conditioning units will decrease sound coming through windows, but will, of course, increase energy costs.
3. Use weather stripping and seal cracks and gaps in exterior siding and walls. Adding brick veneer or even concrete block to outside walls; installing insulation between, or gypsum board over open joists in ventilated attic spaces; installing drop ceilings and placing dampers in fireplaces will reduce noise appreciably.
4. Place furnace and air-conditioning units outside with ducts leading to the house. This will also reduce vibration annoyance.
5. Electrical conduits set rigidly inside walls help transmit noise from one side to the other; if flexible plastic or BX armored cable is used, direct transmission will be eliminated.
6. Installation of laminated glass-and-plastic or of two panes with dead-air space between them can be effective noise barriers.
7. Drapes and curtains help to reduce incoming noise.
8. Hollow and light-weight doors including folding doors are poor noise insulators. Solid doors, especially if gaskets, weather stripping or felt are placed around the edges, provide the best insulation.
9. Use of carpeted and padded floors reduces noise.
10. Installation of drop ceilings and use of acoustical tile reduce reverberation noise in rooms. Sounds die out quicker.
11. Shrubs and trees can be effective buffers between the street and yard if planted properly. They can also add to property value.
12. Make sure that air conditioners, dishwashers, washing machines and other household appliances are in good working order. Repetitious, annoying noises can also mean that appliances are not functioning properly.
13. Keep lawn mowers, power tools and other equipment used in the yard or workshop in proper working condition and operate them at reasonable hours.
14. Play stereo, TV, radio and musical instruments at a level and time that does not disturb others.

15. Take into consideration operating noise levels when buying new appliances.
16. Insure that cars, motorcycles, motorbikes and other powered vehicles are properly tuned and in good working order. Make sure that tires are inflated properly.

AT WORK.....

1. As an employer, be aware of laws, rules, and regulations of government agencies regarding levels of noise permitted in working areas. Take whatever steps are necessary to insure that those levels are not exceeded. Inform employees of their responsibilities in maintaining safe noise levels.
2. As an employee, report all noise problems to employers. Follow all instructions regarding the proper use and maintenance of power equipment. Use ear protectors where necessary, such as around jet engines or high pitched farm equipment.

AT RECREATION AREAS.....

1. Prevent excessive noise from developing from boat engines. Use mufflers and sound absorbing material where possible.
2. When using a camper or trailer, don't recharge batteries at night and early morning hours at campsites.
3. Be courteous when using trail bikes, dune buggies and snowmobiles in recreation areas. Ride them in posted areas.

Courtesy and respectfulness of others at all times when dealing with noise generating equipment and appliances are good manners.

Have hearing periodically checked by a doctor. Ask his advice about acceptable levels of sound. Hearing is important to family and the community. Ears are a protective device that, when damaged, can cause people to take greater risks than they would normally take.

APPENDIX B
LEAGUE OF CALIFORNIA CITIES - MODEL NOISE ORDINANCE

Model Noise Ordinance-League of California Cities*

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY _____ ADDING
CHAPTER _____ TO TITLE _____ OF THE _____
MUNICIPAL CODE PROHIBITING EMISSION OR CREATION OF
NOISE BEYOND CERTAIN LEVELS.

THE CITY COUNCIL OF THE CITY OF _____ DOES ORDAIN
AS FOLLOWS:

Chapter _____ consisting of six articles and entitled "Noise
Regulation" is added to the _____ Municipal Code to read as
follows:

CHAPTER _____. NOISE REGULATION

Article 1. General Provisions

Section _____. Declaration of Policy.

It is hereby declared to be the policy of the City to prohibit unnecessary, excessive, and annoying noises from all sources subject to its police power. At certain levels noises are detrimental to the health and welfare of the citizenry and in the public interests shall be systematically proscribed.

Section _____. Definitions. ⁽¹⁾ **

As used in this chapter, unless the context otherwise clearly indicates, the words and phrases used in this chapter are defined as follows:

(a) Ambient Noise. "Ambient noise" is the all-encompassing noise associated with a given environment, being usually a composite of sounds from many sources near and far. For the purpose of this ordinance, ambient noise level is the level obtained when the noise level is averaged over a period of 15 minutes without inclusion of noise from isolated identifiable sources, at the location and time of day near that at which a comparison is to be made.

(b) Decibel. "Decibel" shall mean a unit of level when the base of the logarithm is the tenth root of ten and the quantities concerned are proportional to power.

(c) Emergency Work. "Emergency work" shall mean work made necessary to restore property to a safe condition following a public calamity or work required to protect persons or property from an imminent exposure to danger to work by private or public utilities when restoring utility service.

(d) Frequency. "Frequency" of a function periodic in time shall mean the reciprocal of the primitive period. The unit is the hertz and shall be specified.

* Abstract from The Quiet City Report - League of California Cities - 1973.

** References refer to footnotes in The Quiet City Report.

- (e) Hertz. "Hertz" shall mean the complete sequence of values of a periodic quantity which occurs during a period.
- (f) Microbar. "Microbar" shall mean a unit of pressure commonly used in acoustics and is equal to one (1) dyne per square centimeter.
- (g) Period. "Period" of a periodic quantity shall mean the smallest increment of time for which the function repeats itself.
- (h) Periodic Quantity. "Periodic quantity" shall mean oscillating quantity, the values of which recur for equal increments of time.
- (i) Person. "Person" shall mean a person, firm, association, copartnership, joint venture, corporation, or any entity, public or private in nature. (2)
- (j) Sound Level. "Sound level" (noise level), in decibels (dB) is the sound measured with the A weighting and slow response by a sound level meter.
- (k) Sound Level Meter. "Sound level meter" shall mean an instrument including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement of sound levels which satisfies the pertinent requirements in American Standard Specifications for sound level meters S1.4-1971 or the most recent revision thereof.
- (l) Motor Vehicles. "Motor vehicles" shall include, but not be limited to, mini-bikes and go-carts.
- (m) Sound Amplifying Equipment. "Sound amplifying equipment" shall mean any machine or device for the amplification of the human voice, music or any other sound. "Sound amplifying equipment" shall not include standard automobile radios when used and heard only by the occupants of the vehicle in which the automobile radio is installed. "Sound amplifying equipment", as used in this chapter, shall not include warning devices on authorized emergency vehicles or horns or other warning devices on any vehicle used only for traffic safety purposes.
- (n) Sound Truck. "Sound truck" shall mean any motor vehicle, or any other vehicle regardless of motive power, whether in motion or stationary, having mounted thereon, or attached thereto, any sound amplifying equipment.
- (o) Commercial Purpose. "Commercial purpose" shall mean and include the use, operation, or maintenance of any sound amplifying equipment for the purpose of advertising any business, or any goods, or any services, or for the purpose of attracting the attention of the public to, or advertising for or soliciting patronage or customers to or for any performance, show, entertainment, exhibition, or event, or for the purpose of demonstrating such sound equipment.
- (p) Noncommercial Purpose. "Noncommercial purpose" shall mean the use, operation, or maintenance of any sound equipment for other than a "commercial purpose." "Noncommercial purpose" shall mean and include, but shall not be limited to, philanthropic, political, patriotic, and charitable purposes.

Section _____. Sound Level Measurement Criteria.

Any sound level measurement made pursuant to the provisions of this chapter shall be measured with a sound level meter using the "A" weighting.

Section _____. Ambient Base Noise Level.

Where the ambient noise level is less than designated in this section the respective noise level in this section shall govern.

Zone	Time	Sound Level A, decibels		
		Community Environment Classification		
		Very Quiet (rural, suburban)	Quiet (suburban)	Slightly noisy (suburban, urban)
R1 and R2	10 pm to 7 am	40	45	50
"	7 pm to 10 pm	45	50	55
"	7 am to 7 pm	50	55	60
R3 and R4	10 pm to 7 am	45	50	55
"	7 am to 10 pm	50	55	60
Commercial	10 pm to 7 am	55	60	
"	7 am to 10 pm	60	65	
M1	anytime	70	70	
M2	anytime	75	75	(3)

Section _____. Violations: Misdemeanors.

Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor and upon conviction thereof, shall be fined in an amount not exceeding ⁽⁴⁾ Five Hundred and no/100ths Dollars (\$500.00) or be imprisoned in the City or County Jail for a period not exceeding six (6) months, or by both such fine and imprisonment. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such.

Section _____. Violations: Additional Remedies: Injunctions.

As an additional remedy, the operation or maintenance of any device, instrument, vehicle, or machinery in violation of any provision of this chapter, which operation or maintenance cause discomfort or annoyance to reasonable persons of normal sensitiveness or which endangers the comfort, repose, health, or peace of residents in the area, shall be deemed and is declared to be, a public nuisance and may be subject to abatement summarily by a restraining order or injunction issued by a court of competent jurisdiction.

Section _____. Severability.

If any provision, clause, sentence or paragraph of this chapter or the application thereof to any person or circumstances, shall be held invalid, such invalidity shall not effect the other provisions or applications of the provisions of this chapter which can be given effect without the invalid provisions or application and, to this end, the provisions of this chapter are hereby declared to be severable.

Article 2. Special Noise Sources

Section _____. Radios, Television Sets, and Similar Devices.

(a) Use restricted. It shall be unlawful for any person within any residential zone of the City to use or operate any radio receiving set, musical instrument, phonograph, television set, or other machine or device for the producing or reproducing of sound (between the hours of 10:00 p.m. of one day and 7:00 a.m. of the following day)⁽⁵⁾ in such a manner as to disturb the peace, quiet, and comfort of neighboring residents or any reasonable person of normal sensitiveness residing in the area. ⁽⁶⁾

(b) Prima facie violation.⁽⁷⁾ Any noise level exceeding the ambient base level at the property line of any property (or, if a condominium or apartment house, within any adjoining apartment) by more than five (5) decibels⁽⁸⁾ shall be deemed to be prima facie evidence of a violation of the provisions of this section.

Section _____. Hawkers and Peddlers.

It shall be unlawful for any person within the City to sell anything by outcry within any area of the City zoned for residential uses. The provisions of this section shall not be construed to prohibit the selling by outcry of merchandise, food, and beverages at licensed sporting events, parades, fairs, circuses, and other similar licensed public entertainment events.

Section _____. Drums.

(a) Use restricted. It shall be unlawful for any person to use any drum or other instrument or device of any kind for the purpose of attracting attention by the creation of noise within the City. This section shall not apply to any person who is a participant in a school band or duly licensed parade or who has been otherwise duly authorized to engage in such conduct.

Section _____. Schools, Hospitals and Churches.

It shall be unlawful for any person to create any noise on any street, sidewalk, or public place adjacent to any school, institution of learning, or church while the same is in use or adjacent to any hospital, which noise unreasonably interferes with the workings of such institution or which disturbs or unduly annoys patients in the hospital, provided conspicuous signs are displayed in such streets, sidewalk or public place indicating the presence of a school, church, or hospital.⁽⁹⁾

Section _____. Animals and Fowl.

No person shall keep or maintain, or permit the keeping of, upon any premises owned, occupied, or controlled by such person any animal or fowl otherwise permitted to be kept which, by any sound, cry, or behavior, shall cause annoyance or discomfort to a reasonable person of normal sensitiveness in any residential neighborhood.

Section _____. Machinery, Equipment, Fans, and Air Conditioning.

It shall be unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five (5) decibels. (10)

Article 3. Construction.

Section _____. Construction of Buildings and Projects.

It shall be unlawful for any person within a residential zone, or within a radius of 500 feet therefrom, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction type device (between the hours of ____ p.m. of one day and ____ a.m. of the next day) (11) in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance unless beforehand a permit therefor has been duly obtained from (the office or body of the City having the function to issue permits of this kind). No permit shall be required to perform emergency work as defined in Article 1 of this chapter.

Article 4. Vehicles.

Section _____. Vehicle Repairs.

It shall be unlawful for any person within any residential area of the City to repair, rebuild, or test any motor vehicle (between the hours of ____ p.m. of one day and ____ a.m. of the next day) in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance.

Section _____. Motor Driven Vehicles.

It shall be unlawful for any person to operate any motor driven vehicle within the City in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance; provided, however, any such vehicle which is operated upon any public highway, street, or right-of-way shall be excluded from the provisions of this section. (12)

Article 5. Amplified Sound. (13)

Section _____. Purpose.

The Council enacts this legislation for the sole purpose of securing and promoting the public health, comfort, safety, and welfare of its citizenry. While recognizing that the use of sound amplifying equipment is protected by the constitutional rights of freedom of speech and assembly, the Council nevertheless feels obligated to reasonably regulate the use of sound amplifying equipment in order to protect the correlative constitutional rights of the citizens of this community to privacy and freedom from public nuisance of loud and unnecessary noise.

Section _____. Registration: Required.

It shall be unlawful for any person, other than personnel of law enforcement or governmental agencies, to install, use, or operate within the City a loudspeaker or sound amplifying equipment in a fixed or movable position or mounted upon any sound truck for the purposes of giving instructions, directions, talks, addresses, lectures, or transmitting music to any persons or assemblages of persons in or upon any street, alley, sidewalk, park, place, or public property without first filing a registration statement and obtaining approval thereof as set forth in this Article.

Section _____. Registration: Requirements and Duties.

(a) Registration statements: Filing. Every user of sound amplifying equipment shall file a registration statement with the (officer or department) _____ () days⁽¹⁴⁾ prior to the date on which the sound amplifying equipment is intended to be used, which statement shall contain the following information:

- (1) The name, address and telephone number of both the owner and user of the sound amplifying equipment;
- (2) The maximum sound producing power of the sound amplifying equipment which shall include the wattage to be used, the volume in decibels of sound which will be produced, and the approximate distance for which sound will be audible from the sound amplifying equipment;
- (3) The license and motor number if a sound truck is to be used;
- (4) A general description of the sound amplifying equipment which is to be used; and
- (5) Whether the sound amplifying equipment will be used for commercial or noncommercial purposes. ⁽¹⁵⁾

(b) Registration Statements: Approval. (Office or department approving registration statement) shall return to the applicant an approved certified copy of the registration statement unless he finds that:

- (1) The conditions of the motor vehicle movement are such that in the opinion of _____, use of the equipment would constitute a detriment to traffic safety; or
- (2) The conditions of pedestrian movement are such that use of the equipment would constitute a detriment to traffic safety; ⁽¹⁶⁾ or
- (3) The registration statement required reveals that the applicant would violate the provisions set forth in Section ____ of this Article or any other provisions of this Code.

(c) Disapproval. In the event the registration statement is disapproved, the _____ shall endorse upon the statement his reasons for disapproval and return it forthwith to applicant.

Section _____. Appeals.

Any person aggrieved by disapproval of a registration statement may appeal by complying with the provisions of Section _____ of this Code relating to appeals.

Section _____. Fees.

Prior to the issuance of the registration statement, a fee in the amount of \$_____ per day, or any portion thereof, shall be paid to the City, if the loudspeaker or sound amplifying equipment is to be used for commercial purposes. ⁽¹⁷⁾ No fee shall be required for the operation of a loudspeaker or sound amplifying equipment for noncommercial purposes.

Section _____. Regulations.

The commercial and noncommercial use of sound amplifying equipment shall be subject to the following regulations:

- (a) The only sounds permitted shall be either music or human speech, or both.
- (b) The operation of sound amplifying equipment shall only occur between the hours of _____ a.m. and _____ p.m. each day except on Sundays and legal holidays. No operation of sound amplifying equipment for commercial purposes shall be permitted on Sundays or legal holidays. The operation of sound amplifying equipment for non-commercial purposes on Sundays and legal holidays shall only occur between the hours of _____ a.m. and _____ p.m.
- (c) Sound level emanating from sound amplifying equipment shall not exceed (15) decibels above the ambient base noise level. ⁽¹⁸⁾
- (d) Notwithstanding the provisions of subsection (c) of this section, sound amplifying equipment shall not be operated within 200 feet of churches, schools, hospitals, or City or County buildings.
- (e) In any event, the volume of sound shall be so controlled that it will not be unreasonably loud, raucous, jarring, disturbing, or a nuisance to reasonable persons of normal sensitiveness within the area of audibility.

(OPTIONAL PROVISION)

Article _____. Train Horns and Whistles ⁽¹⁹⁾

Section _____. Excessive Sound Prohibited.

It shall be unlawful for any person to operate or sound, or cause to be operated or sounded, (between the hours of 10:00 p.m. of one day and 7:00 a.m. of the next day) ⁽²⁰⁾ a train horn or train whistle which creates a noise level in excess of eighty-nine (89) decibels at any place or point 300 feet or more distant from the source of such sound.

Article 6. General Noise Regulations

Notwithstanding any other provision of this chapter, and in addition thereto, it shall be unlawful for any person to wilfully make

or continue, or cause to be made or continued, any loud, unnecessary, or unusual noise which disturbs the peace or quiet of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitiveness residing in the area.⁽²¹⁾

The standards which shall be considered in determining whether a violation of the provisions of this section exists shall include, but not be limited to, the following:

- (a) The level of the noise;
- (b) The intensity of the noise;
- (c) Whether the nature of the noise is usual or unusual;
- (d) Whether the origin of the noise is natural or unnatural;
- (e) The level and intensity of the background noise, if any;
- (f) The proximity of the noise to residential sleeping facilities;
- (g) The nature and zoning of the area within which the noise emanates;
- (h) The density of the inhabitation of the area within which the noise emanates;
- (i) The time of the day or night the noise occurs;
- (j) The duration of the noise;
- (k) Whether the noise is recurrent, intermittent, or constant; and
- (l) Whether the noise is produced by a commercial or non-commercial activity.

LIST OF NOISE SOURCES

- I. Approach to Problem
 - A. Define the problem
 - B. Identify chief sources of noise in the city
 - C. Investigate various means and resources by which noise may be abated
 - D. Establish acoustical criterion
 - E. Implement principles and methods
- II. Sources of Noise
 - A. Transportation
 - 1. Rail
 - a. Train track noise
 - b. Breaking
 - c. Squeak of wheels on curves
 - d. Whistles
 - e. Air brakes
 - 2. Trucks
 - a. Exhaust noise
 - b. Engines
 - c. Transmission and differential noise
 - d. Chain drive noise
 - e. Chassis noise
 - f. Brakes
 - g. Air compressors
 - h. Sheet metal parts
 - i. Tire whine
 - 3. Automobiles
 - a. High speed tire squeal
 - b. Tire tread noise
 - c. Rattles
 - d. Engine noise
 - e. Exhaust
 - f. Horns
 - g. "Cutouts"
 - 4. Aircraft
 - a. Piston engines
 - b. Jet aircraft noise
 - c. Helicopter blade noise
 - B. Industrial Noise
 - 1. Out-of-doors processing
 - a. Air intake
 - b. Discharge ducts
 - c. Compressors
 - d. Engine intakes and exhausts
 - e. Pump and engine radiation
 - f. Steam discharge
 - 2. Enclosed Industrial Plant
 - a. All of above
 - (1) With open windows
 - b. Fans and blowers
 - c. Punch presser

- d. Machine tools
 - e. Forging equipment
 - f. Printing presses
- 3. Out-of-doors operations
 - a. Warehousing of steel and lumber
 - b. Scrap yards
 - c. Truck and rail freight handling
 - d. Transportation and loading
 - (1) Freight cars
 - (2) Local yard movements
- 4. Plant auto traffic
 - a. Shift employees
 - (1) Leaving and arriving at early or late hours
- C. Construction Noise
 - 1. Diesel engines
 - a. Generators
 - b. Compressors
 - c. Trucks
 - d. Shovels
 - e. Bulldozers
 - f. Frontloaders
 - g. Scrapers
 - h. Power shovels
 - i. Rock drills
 - 2. Electric Motors
 - a. Whining and groaning sounds
 - 3. Air Compressors
 - a. Intake and discharge
 - 4. Blasting
 - 5. Pile driving
 - a. Engine
 - b. Hammer driven caissons
 - 6. Riveting
 - a. Hammer
 - b. Electric or pneumatic nut-setter
 - 7. Materials handling equipment
 - a. Demolition
 - b. Scrap material handling
 - c. Elevators
 - d. Cement mixers
 - 8. Special equipment
 - a. Generators
 - b. Rock drills
 - 9. Interior finishing
 - a. Residential construction
 - b. Hammers
 - c. Power saws
 - d. Electric drills
- D. Heating, Ventilating and Air-Conditioning
 - 1. Air Conditioning
 - a. Cooling tower
 - (1) Fans
 - (2) Water Spray

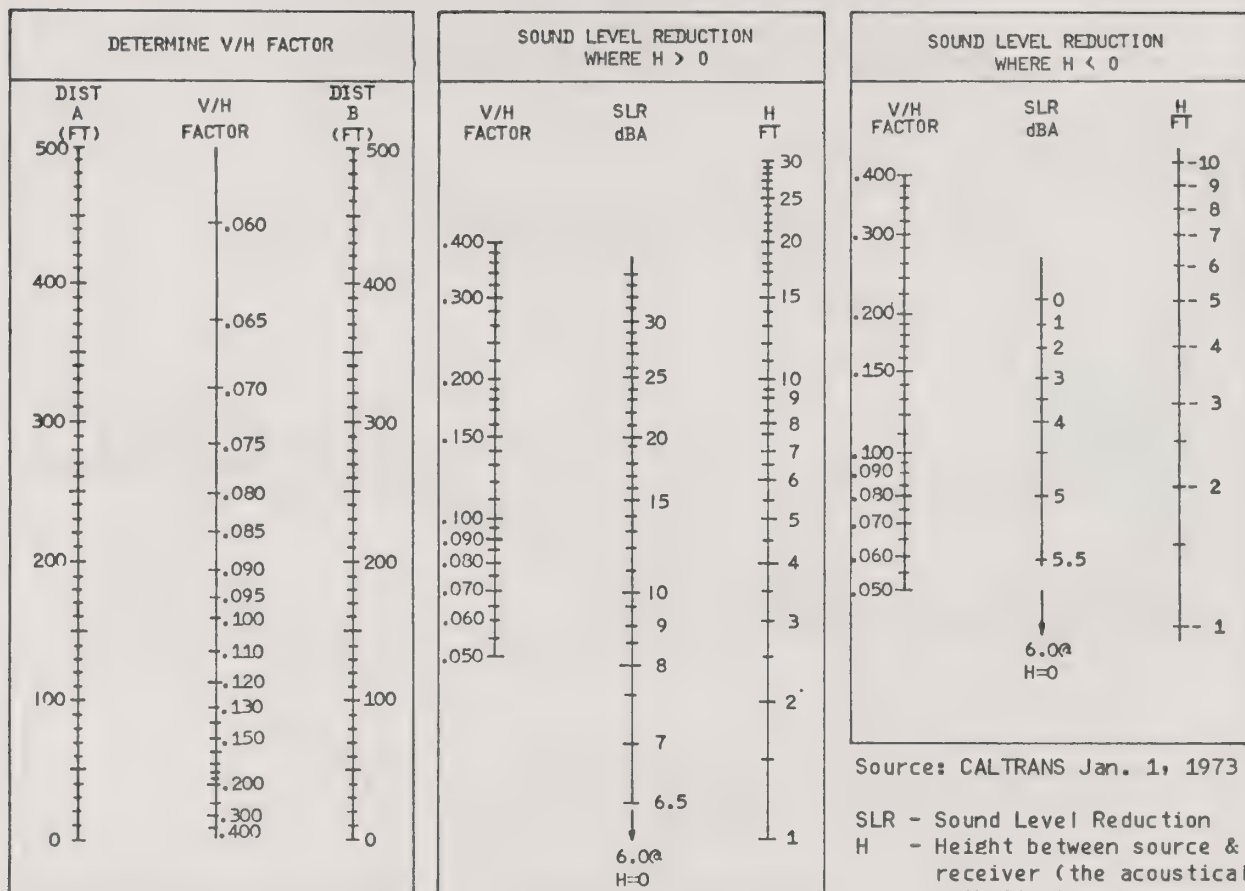
- b. Window units
 - (1) Compressor
 - (2) Fan
 - (3) Rattles
 - c. Intakes and discharges
 - d. Draft fans
 - e. Oil burners
 - f. Combustion
 - g. Pumps
 - h. Attic ventilating fans
 - E. Non-Environmental Interaction Noise
 - 1. Leisure activities
 - a. Radios
 - b. Stereos
 - c. T.V.
 - d. Musical instruments
 - e. Workshop and home improvement tools
 - 2. Outdoor activities
 - a. Power mowers
 - b. Hedge trimmers
 - c. Chain saws
 - d. Auto repairs
 - (1) Engine run-up
 - 3. Talking
 - a. On street
 - b. Arguments
 - c. Parties
 - 4. Vehicles
 - a. Ice cream trucks
 - b. Delivery trucks
 - c. Ambulances
 - d. Fire vehicles
 - e. Motorcycles
 - 5. Refuse collection
 - a. Trash cans
 - b. Engine exhaust
 - c. Loaders and compactors
 - 6. Meeting noises
 - a. Street meetings
 - b. Religious meetings
 - c. Concerts
 - d. Church bells
 - 7. Children at play
 - a. School yard
 - b. Playground
 - c. Street
 - d. Yards
 - 8. Animals
 - a. Barking dogs
 - 9. Sound Trucks

III. Conclusion

- A. Success in noise abatement depends on making the public aware of what can be done, securing public support for City programs, and getting voluntary reduction in noise generated by individuals.

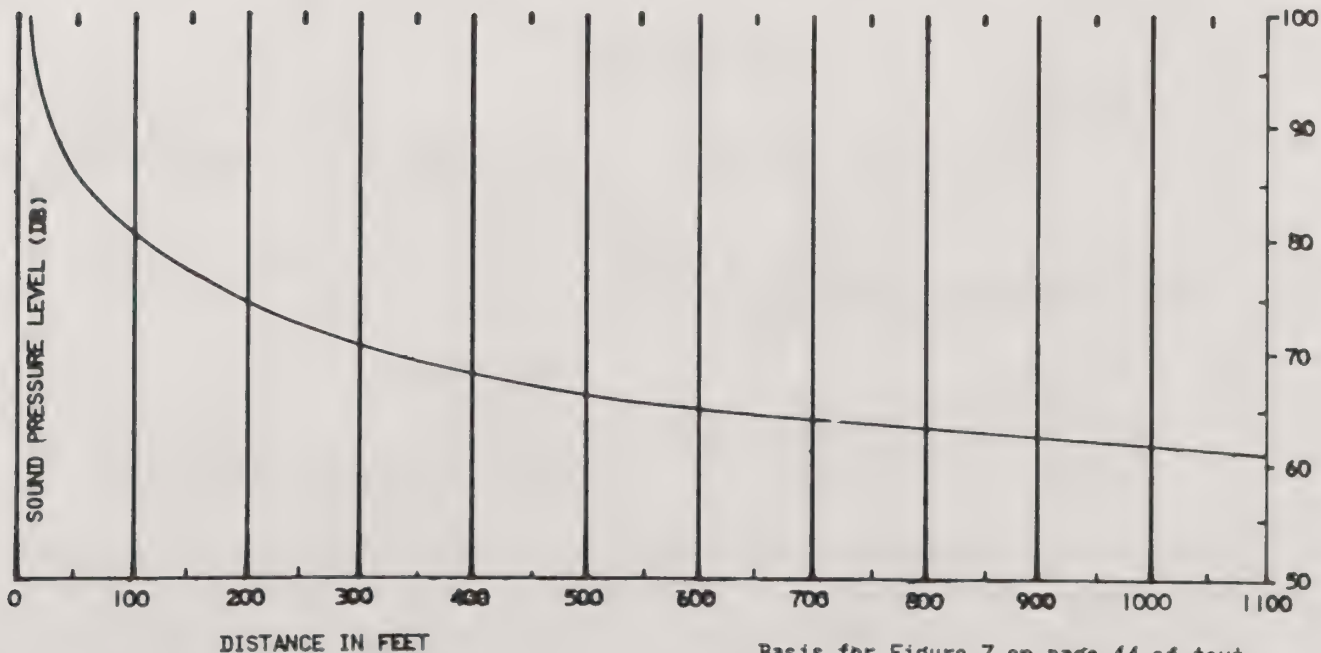
APPENDIX C
HIGHWAY NOISE AND DESIGN VARIABLES

NOISE BARRIER ATTENUATION NOMOGRAPH



(cross ref. Noise Nomographs on following pages)

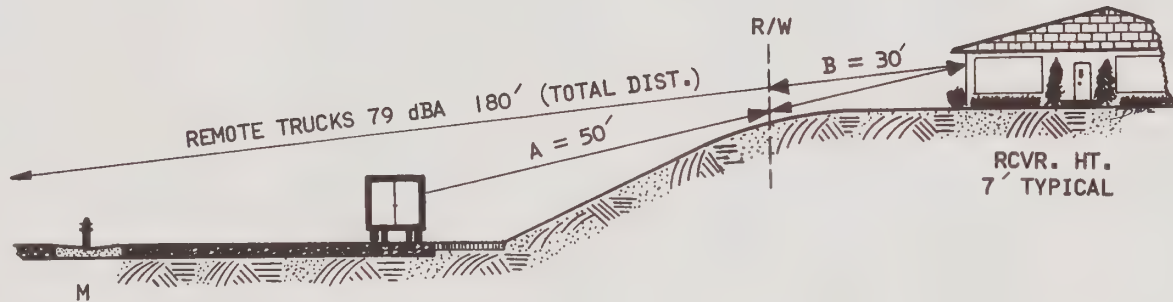
NOISE REDUCTION WITH DISTANCE (Due to Inverse Square Law)



Basis for Figure 7 on page 44 of text

USING THE NOISE NOMOGRAPH ON DEPRESSED HIGHWAYS

CONVENTIONAL DESIGN



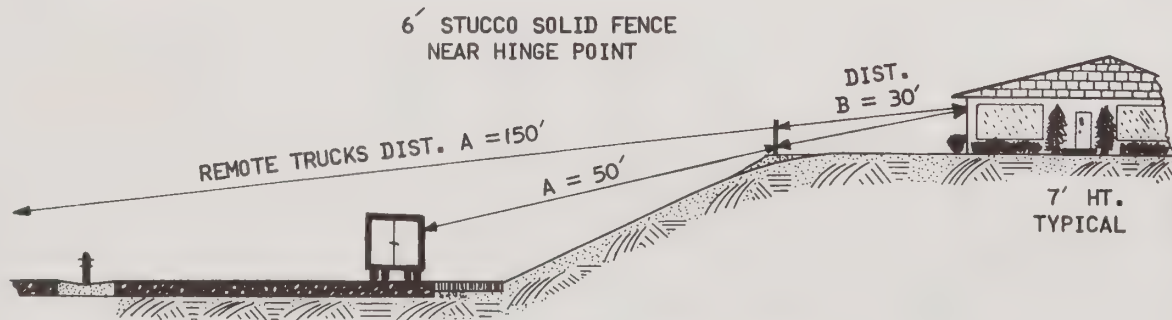
(MEDIAN TYPICAL L.A. OR S.F.)

LEGAL MAX. TRUCK NOISE 80 = 86.0 dBA
SLR SOUND LEVEL REDUCTION = -3.5
NOISE AT RESIDENCE 82.5 dBA = NEAREST TRUCKS

NEAREST TRUCKS

V/H = .200
H = -2'
SLR = 3.5 dBA

SHIELDED DESIGN



REMOTE TRUCKS

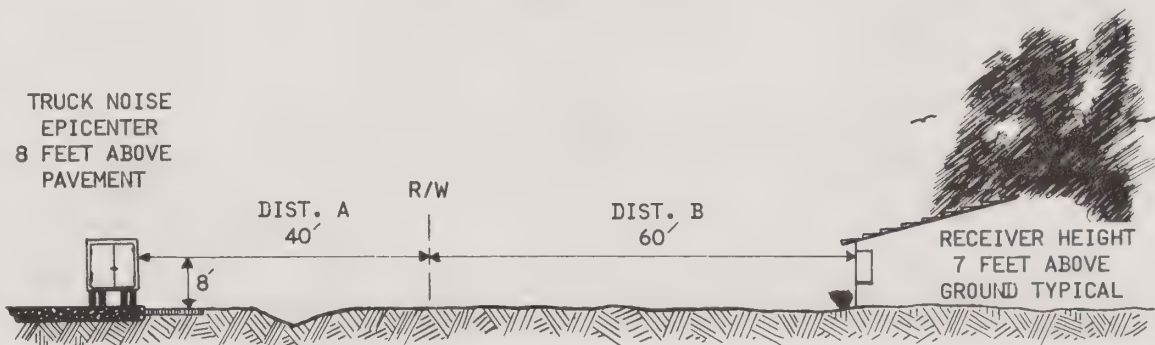
V/H = .135
H = 2
SLR = 10.5
79.0 dBA
-10.5 SLR
68.5 dBA

NEAREST TRUCKS

86.0 dBA
-18.7 SLR
67.3 dBA
V/H = .200
H = 5
SLR = 18.7 dBA

USING THE NOISE NOMOGRAPH ON HIGHWAYS IN FLAT TERRAIN

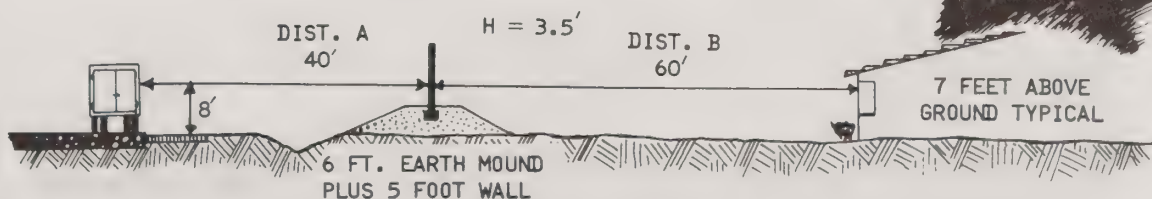
CONVENTIONAL DESIGN



LEGAL MAX. FROM A FULLY EXPOSED TRUCK	84 dBA (100')
SOUND LEVEL REDUCTION	0
NOISE AT RESIDENCE	84dBA

SHIELDED DESIGN

V/H .18
H 3.5
SLR 15.5 dBA



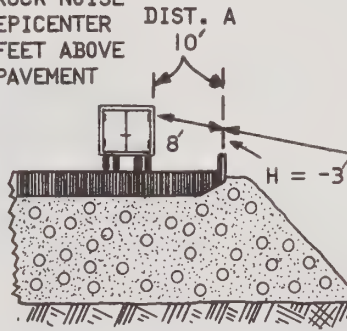
LEGAL MAX. FROM A FULLY EXPOSED TRUCK	84.0 dBA
(SLR) SOUND LEVEL REDUCTION	15.5
NOISE AT RESIDENCE	68.5 dBA

NOTE:
THE NOISE BARRIER HEIGHT IS THE PORTION "H"
ABOVE A LINE FROM THE SOURCE EPICENTER
TO EAR HEIGHT AT THE RECEIVING POSITION.

USING THE NOISE NOMOGRAPH ON ELEVATED HIGHWAYS

CONVENTIONAL DESIGN GUARD RAIL ONLY

TRUCK NOISE
EPICENTER
8 FEET ABOVE
PAVEMENT



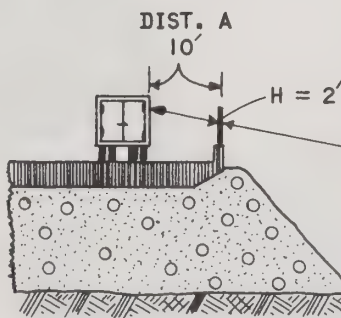
$V/H = .17$
 $H = -3$
 $SLR = 3 \text{ dBA}$



RECEIVER HEIGHT
7 FEET ABOVE
GROUND TYPICAL

LEGAL MAX. FROM A FULLY EXPOSED TRUCK = 83 dBA 110'
SLR SOUND LEVEL REDUCTION = -3
NOISE AT RESIDENCE = 80 dBA

SHIELDED DESIGN WITH A 6 FOOT BARRIER ADDED ABOVE THE 2 FOOT GUARD RAIL



$V/H = .17$
 $H = 2$
 $SLR = 12 \text{ dBA}$



RECEIVER HEIGHT
7 FEET ABOVE
GROUND TYPICAL

LEGAL MAX. FROM A FULLY EXPOSED TRUCK = 83 dBA
SLR SOUND LEVEL REDUCTION = -12
NOISE AT RESIDENCE = 71 dBA

APPENDIX D
STATE GUIDELINES FOR PREPARING A NOISE ELEMENT

- D. Standards and criteria for compatible noise level for local 'fixed-point' noise sources.
- E. Guide to implementation.
- F. Appendix describing methodology of preparation and sources of data.

3. METHODOLOGY

- A. Preliminary identification of problem noise areas.
- B. Collect data on existing and proposed transportation noise sources. Such transportation noise data is to be provided by the agency constructing and operating the facilities. Such data may be expressed in the acoustical scale recommended in Section 65302(g), or any professionally acceptable acoustical scale used consistently throughout the preparation of the noise element.
- C. Collect data on general noise levels throughout the community related to types of use. In collecting data, the differences among kinds of noises should be recognized. The impact of noise on the individual varies with its frequency, pitch, duration and cyclic consistency; the presence of masking noises in the environment; and the sound's familiarity.
- D. Review information from published sources regarding effects of noise on people's activities, health and well being.
- E. Establish committees or other procedures for developing citizen input and awareness of problems, issues and opportunities.
- F. Survey noise control regulations from other jurisdictions giving special attention to regulations from jurisdictions with characteristics similar to the local community.
- G. Formulate general policy statements responsive to local issues and problems.
- H. Prepare standards and criteria relating noise levels to types of use and environmental factors.
- I. Set measurable goals for the reduction of noise in problem areas.

4. DEFINITION OF TERMS

Sound intensity: A measure of the loudness of sound.

Noise contour: A line on passing through points where the same sound intensity level prevails. Contours form bands of varying width emanating from a noise source.

Decibel: A unit for measuring the relative loudness of sounds detectable by the human ear.

5. RELATIONSHIP OF THE NOISE ELEMENT

A. To other elements:

The noise element is related most closely to the circulation, land use and housing elements, since it provides noise level standards related to the compatibility of land use, of which residential use will be a highly important component. Noise level standards thus can be the decisive factor in locating transportation facilities (or their design) in relation to existing or planned land use. Consideration should be given to the adverse effects of noise on activities taking place both in the out-of-doors and in structures not insulated against sound. The noise element is also closely related to the open space element since noise can adversely affect the enjoyment of quiet pursuits in open space. Conversely, open space can be employed to buffer noise sources from sensitive uses through distance and extensive tree planting.

B. To environmental impact questions:

Social: Excessive noise is socially disruptive, and may be physically and psychologically damaging.

Economic: Excessive noise adversely affects property values and levels of productivity. In the past the costs of excessive noise from transportation facilities have been passed on to those in the vicinity rather than being borne by the producer of the noise.

C. To other agencies:

The law requires state, local or private agencies responsible for the construction and maintenance of major transportation facilities, provide present and projected noise levels for their facilities. This includes (but is not limited to):

State Department of Transportation
Regional Transit Authorities
Local Public Works Departments
Rapid Transit Districts
Airport Ground Facilities
Private Air Carriers
Private Freight Carriers
Railroad Companies

6. IMPLEMENTATION

- A. Noise ordinances and regulations. The zoning ordinance may be utilized since it can vary levels of permissible noise by zoning district-relating noise level to type of use and situation.
- B. Maintain liaison with transportation agencies regarding reduction in noise from existing facilities and control of noise through design and location and new facilities.
- C. Revise other elements of general plan as appropriate to give recognition to noise level/land use relationships and other relevant matters. Revise circulation element to divert through traffic from residential streets.

- D. Revise building code to reduce noise transmission in or from building and provide for additional sound insulating in high noise areas.
- E. Liaison with health departments in the preparation of standards and ordinances and for assistance in on-site measurements of noise level.
- F. Construct sound barriers, particularly surrounding noise intolerant areas such as between residential areas and freeways.

APPENDIX E
GLOSSARY

GLOSSARY

ACOUSTICS - The science for the production, control, transmission, reception and effects of sound and of the phenomenon of hearing.

AMBIENT NOISE - All environmental noise which is usually a composite of sound from many sources near and far.

THE AMBIENT NOISE LEVEL - Calculated as an average noise level over a period of 15 minutes without inclusion of noise from isolated identifiable sources.

CNEL - Community Noise Equivalent Level. Places greater emphasis on measuring of night vs. day noise. A scale that takes into account all the A weighted acoustic energy received at a point, from all noise events causing levels of noise above a prescribed value.

CNR - Composite noise rating for airport environments often used by Department of Defense.

DECIBEL - A logarithmic scale applied to the description of sound levels.

DISTANCE TO OBSERVER - Distance from center-line of highway to nearest point of measurement. ($DE = DN DF$; where DN and DF are distances from near and far lanes.

FIXED POINT NOISE SOURCE - Any noise generator which is non-mobile in nature and creates noise in volume which may be in excess of acceptable standards as identified within this report.

FREEWAY - As differentiated from highways, freeways have controlled access. Access to and from other public roads is limited to specific locations.

FREQUENCY - Characteristic of sound that is measured in cycles per second, or hertz; high frequency sounds are shrill and low frequency sounds are deep.

HERTS (Hz) - Unit of frequency, equivalent to 1 cycle per second.

L10dBA - A specific noise level that will be exceeded 10% of the time (i.e. L10 70 db(A) means the noise level will be greater than 70 decibels 10% of the measured time.

LDNdBA - A specific noise level that is exceeded during the day and night period. Day and night noise levels are differentiated.

LOUDNESS - A measure of the subjective magnitude of a sound.

NET NOISE REDUCTION - Decibel rating after barrier or attenuation computations are calculated.

NOISE - Any unwanted sound that disturbs, harms, or encroaches on the safety, health or well being of man and the environment.

NOISE CONTOUR - Lines of equal noise level.

NOMOGRAPH - A graph that enables one, by the aid of a straight-edge to read off the value of a dependent variable when the values of two or more independent variables are given.

PERIOD - The smallest increment of time for which the function repeats itself.

SOUND - Energy that is transmitted by longitudinal pressure waves in air or other material and is the objective cause of the sensation of hearing.

SOUND INTENSITY - A measure of the loudness of sound.

SOUND LEVEL - A measure of the level of a sound with the A-weighting network in the measurement chain. If the A-weighting is used, the sound level is expressed in dB(A).

SOUND LEVEL METER - An instrument for the measurement of noise and sound levels in accordance with an American standard.

SOUND PRESSURE LEVEL - The fundamental measure of sound levels using the decibel unit, defined as

$$SPL = 20 \log_{10} \frac{P}{P_0} \text{ dB}$$

where P_0 is the reference pressure of 20 Pa.

TEMPORARY NOISE SOURCES - Those sources of noise generation which are of a fixed point nature and occur at infrequent intervals (trash collection, construction work, tree pruning, etc.).

WEIGHTING NETWORK - An electronic circuit which attempts to reproduce the frequency response characteristic of the human ear. The A-weighting network is often recommended.

APPENDIX F
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APPENDIX G
ENVIRONMENTAL IMPACT REPORT

E.R.C. 74-402/EIR
X-Ref. Tul. Co. Pla. Dept.
Noise Element, Tulare Co.
General Plan
January 17, 1975
X-Ref. Seismic Safety EIR

ENVIRONMENTAL IMPACT REPORT

DESCRIPTION OF PROJECT:

The Noise Element for all city and county general plans in the State of California is mandated by the State Legislature due to the increasing risk associated with high levels of noise throughout the primarily urban areas of California. Tulare County, although not considered an urban county or an urban area, does have urbanizing areas that are beginning to experience many of the difficulties associated with noise that is impacting the larger urban areas. Therefore, the Noise Element is required for the County and its cities due to the real but very difficult assessments of noise hazard and control.

Section 65302(g) of the Governmental Code and the Council on Intergovernmental Relations Guidelines, issued in 1973, give scope and direction for the development of a Noise Element. The Tulare County Noise Element has been prepared with these guidelines in mind and with advice and interpretation provided by the County Counsel of Tulare County. In some cases, the scope of these guidelines has been enlarged where necessary to meet the goals of the County. The Noise Element can be adopted as is or with modifications as desired by cities within the County. Only the Tulare County Association of Governments including member cities and the County have the power and authority to adopt the Noise Element. They may adopt the Element with modifications as desired or with addendums to fit more special needs of any given city within the County.

DESCRIPTION OF EXISTING ENVIRONMENT:

Tulare County lies in the southern half and on the east side of the San Joaquin Valley, known as the Great Central Valley of California, which is bounded on three sides by mountains - the Coast Range to the west, the Sierra Nevadas to the east and south. The County itself covers approximately 4,863 square miles and includes 3,112,320 acres. About one-fourth of the area is suitable for cultivation, primarily the western side of the County. The Federal government owns 1,545,638 acres or 49.6 percent of the County, of which all but about 60,000 acres is public forest and recreation land. Sequoia & Kings Canyon National Parks comprise over 845,000 acres of Federally owned land. The 60,000 acres includes the Tule River Indian Reservation (54,000 acres) and various canals and reservoirs. The State of California owns 26,436 acres (.8%), of which 5,000 acres is in public forest. This amount of State and Federal ownership means that only slightly under 50% of Tulare County land is directly under the control of local government. This does not mean, however, that noise as a problem does not creep into these areas as a result of development and activity generated on the valley floor.

Tulare County has eight incorporated cities. Their urban area projected populations in 1973 were:

Visalia	47,600	Lindsay	8,900
Porterville	27,450	Exeter	5,800
Tulare	25,500	Farmersville	4,400
Dinuba	10,000	Woodlake	4,000

Approximately 50 rural service centers, generally occurring at five mile intervals along arterials are found throughout the valley. In 1970, about 67 percent of the County residents were in urban densities; by 1990 a figure of 86 percent is anticipated.

Transportation is mainly by roads. State Highway 99 and Interstate 5 are the major transportation arteries and carry traffic in a north-south direction through the valley. The rugged heights of the Sierra Nevadas preclude east-west highways in this area and access to this portion of the Sierra Nevadas is limited. The area also has Amtrak, Southern Pacific and the Santa Fe Railroads service. Visalia has regularly scheduled stops of commercial airlines. There are also several air fields serving private aircraft.

The Valley lands are nearly level, with very gently to rolling slopes along the valley margins. Elevations range from sea-level to about 500 feet. The foothill area is characterized by rolling to hilly relief and dissected by numerous streams flowing gently into the valley. The foothill area begins as terraces along the east edge of the valley floor, merges into gentle slopes, then becomes steep. "Foothill" elevations range from about 500 to 3,000 feet. The mountain area, with elevations from 3,000 to 14,495 feet (Mt. Whitney is the highest point in the United States outside of Alaska) is characterized by hilly to steep mountains, with valleys of 3,000 to 7,000 feet in height.

The County contains numerous highways and roads that have been constructed with the use of Federal aid funds and several major north-south and east-west Federal highways (or freeways as they are commonly called in California) pass through the County, these being U. S. Highway 65, passing north from U. S. 99 in Kern County to Porterville and then to Lindsay; U. S. Highway 99 passing from the south boundary of the County to the north boundary; Highway 198 crossing in an east-west direction to the Sequoia National Forest and across the valley floor; U. S. Highway 63 stemming off of U. S. Route 99 in Tulare and going into the City of Visalia is one of the largest traffic carriers in the County. The large network of roads that cover the valley floor are primarily for the purpose of moving agricultural goods and services and providing intra-community contact within the County and within the State. Some of the largest County highways carry 5,000 or more automobiles and include Avenues 416, 384, 304, 280, 248, 240, 232, 224, 216, 56 and 48; (It should be noted that Avenues run in an east to west direction while roads run in a north-south direction) and Roads 8, 56, 80 and portions of 88 and 96 near Tulare, side roads adjacent to U. S. Route 99, 104, 120, small pieces of 128 and other arterials in and around the City of Visalia, 152, 166, 192, 196, 208, 216, 224 near Lindsay, plus a number of small roadway sections in and around the City of Porterville, that are local arteries, and a sizeable portion of Road 256 in and near Porterville. None of the mountain routes that enter the forest and mountain areas of the County carry over 5,000 vehicles per day on the average as calculated on a yearly basis, with the exception of such routes as Highways 198 and 190 that go to major tourist attractions and centers. These routes may, on any given day, carry very large volumes of traffic and thus the noise level is increased in those areas during those times of the year. Tourist activities are increasing all through the mountain areas both in the winter as well as the summer in the County of Tulare.

The County contains lands subject to slope instability and high erosion potential with lesser amounts subject to soil subsidence and liquefaction. The valley floor is underlain with thick alluvium deposits while the mountainous areas are underlain by large granite or other masses of varying texture, thickness and stability. The

central valley is a deep trough. Tulare County forms part of this trough filled with sediment deposited by rivers from nearby mountains when the valley was being formed. The County contains nearly all classes of soil (from I to VIII, except V as identified by U.S.S.C.S.) as the result of erosion activity as well as natural processes of nature that have occurred over millenniums of time.

The primary industry in Tulare County is agriculture. The County rates third in the nation in terms of dollar income earned from high income producing lands, especially to the east and near the foothills of the mountain ranges where citrus, avocados and stone fruits are grown. Other examples of major crops grown in the County include grapes, small grains, cotton, pasture, fruits, nuts, beets, and dry beans.

Protection from flooding is important for valley soils because they are usually poorly drained and the facilities necessary for carrying on agricultural activity are extremely sensitive to flooding activity. In addition, the communities that have sprung up on the valley floor in the past were often situated within potential flood plain areas. Consequently, a number of large and small dams are located within the mountainous and foothill areas of the County for storage of mountain storm water runoff so that it can be used in the summer months for agricultural use in the valley. The water is also used for recreation, drinking, industrial activity, and generation of power. Portions of the valley floor having alkali and salt problems mostly to the southeast of the County, and in Kings County to the west, must undergo reclamation in order to be cultivated and this often requires large amounts of water to dilute the salts

SOILS:

Alluvial Fans and Floodplain Soils:

Little or no conservation efforts are required for soils of these usually deep and well-drained, non-saline and non-alkaline soils. Erosion is no problem.

Low Terrace Soils:

When these are saline-alkali with hardpan, reclamation becomes difficult. Characterized by low fertility and moisture capacity.

Terrace Soils:

Shallow with low fertility and moisture capacity. Erosion is a problem. Well-drained, sandy, wind-modified soils. These are low in fertility and moisture capacity and have wind erosion problems.

Foothill Soils:

Principal crops are deciduous fruits and grains. These soils break into two basic types: shallow, well-drained, slightly acid, stoney or rocky medium textured upland or moderately deep to deep moderate coarse textured, well-drained, slightly acid upland.

The shallow soils have conservation problems due to lack of depth and concentration of rocky materials, but erosion is only slight if enough vegetation remains to hold the soil in place. The moderately deep to deep soils are low in fertility and tend to be strongly erosive in character.

Sierra Nevada Soils:

The uses are usually recreation or lumbering, with some grazing. The land is managed by the U. S. Forest Service, National Park Service and Bureau of Land Management. There are four general types of soil mantle consisting of upland soils of high to medium elevation, shallow to moderately deep, coarse and moderately coarse textured; alluvial soils that are found in mountain valleys, often poorly drained, moderately coarse to moderately fine textured. The soils are found on hilly to mountainous terrain; erosion results when soils are disturbed. Shallower soils found in the mountainous areas are handicapped by their depth and low water holding capacity. The mountain valley soils often have drainage problems, possibly gullying, and low potential for being cultivated.

The major man-made bodies of water are Lake Kaweah and Lake Success. Both are situated at the edge of foothills behind earth and rockfill dams with capacities (not counting flood surcharge spilling) of 8,000 to 150,000 acre feet at Kaweah and 9,000 to 82,000 acre feet at Success. The Friant-Kern Canal has a conveying capacity average of 5,000 cubic feet per second at the head which is located at Friant.

BIOTA:

Endangered Species:

Blunt-Nosed Leopard Lizard
California Condor
Southern Bald Eagle

San Joaquin Kit Fox
American Peregrine Falcon

Rare Species:

Giant Garter Snake
Southern Wolverine
California Bighorn Sheep

Spotted Bat*
Prairie Falcon*
Yellow-Billed Cuckoo*

*(According to U. S. Dept. of Interior - not identified in preliminary Biological Resources Element of Tulare County)

Special Concern:

California Slender Salamander
Golden Trout
Great Blue Heron

Ferruginous Hawk
Osprey
Tiger Salamander

There are many other species including coyote, hawks, snakes, rabbits, cats, rodents, etc.

The lowest zone, the Upper Sonoran Zone is located from 500 to 5,000 ft. in elevation. The Transition Zone (1,200 to 9,000 feet) is dominated by yellow pine. The Canadian Zone (up to 10,000 feet) is dominated by lodgepole pine and red fir. The Hudsonian Zone or (subalpine belt) can be identified by whitebark pine and delicate flowers which can be found during the short three month growing season. The Alpine Zone is a vast and cold terrain where winds can reach 120 miles per hour.

BACKGROUND OF THE NOISE ELEMENT:

The Noise Element was begun in the fiscal year 1973-74 and the major portion of the work was completed in the summer of 1974. Portions of the work were carried out under the auspices of a grant administered by TCAG (CPA 1020.19) through the CIR. The Council of Fresno County Governments was instrumental in putting on a Noise Study Conference in the summer of 1974 which drew participants from all over the central valley. State and Federal officials were on hand to answer many of the questions that the local agencies had in regard to preparation of the Element and some of the limitations that could be expected when preparing such an element.

Early in the preparation of the Element, it was found necessary to involve other departments within the County and the Cities. In addition, it was found necessary (in conformance with Federal rules and regulations) to involve citizen groups and committees as needed. The citizens provided background for reviewing the plan as it was prepared. The Cities and the County at various times during the preparation of the study offered additional recommendations and suggestions. The Agricultural Advisory Committee and the Environmental Quality Committee of Tulare County were involved early in the process in order to set goals and objectives and the general tone of the study. After obtaining general agreement among citizens and advisory committees and at the direction of the Planning Director, a technical advisory committee was established for reviewing and overseeing the work of the staff. In addition, the Planning Commission, at their regularly scheduled public meetings, reviewed the progress of the work and made comments regarding its direction and scope.

All meetings of the advisory committees and technical committees were held at times convenient to the public at large and interested participants.

During the preparation of the Element, one of the major efforts undertaken to involve the community at large was a newspaper survey that was printed in all of the County newspapers. The survey gave the staff data by which to formulate more specific aspects of the element; results of the survey were calculated and utilized in the preparation of the Element. It was recognized early in the process that noise is, to a great degree, a subjective consideration and the validity of the study would, of necessity, have to involve the community at large. (Over 300 responses were received in the Tulare County newspaper survey which compared very favorably to the survey undertaken by Stanislaus County in the preparation of their Noise Element. The findings were similar in many respects. In addition, the two counties have about the same population (200,000) and are primarily agricultural.)

The major portion of the technical assistance given to the staff came from the Environmental Health Division of the County Health Department, which has considerable expertise in health and safety problems related to noise. Chapter II of the Element is a direct reflection of the viewpoint of the Tulare County Health Department and is primarily concerned with the health aspect of environmental noise. (Commonly referred to in Federal Environmental Protection Agency literature as "community noise.")

One aspect of the report that was expressed in the meetings with the advisory committees was that the Element should be usable by a variety of people from individuals to community and government bodies. For this reason, the report includes recommendations for ways in which to eliminate noise within the home, around the home, within the community at large, and as a direct result of transportation and land use planning policy. Staff has attempted to address all of the problems that were raised by the advisory committees and in the survey that was undertaken; however, many of the questions or concerns were beyond the scope of this project.

It should be noted that Federal and State governments have control over certain aspects of noise, for example, the noise characteristics that emanate from machinery and manufacturing goods (particularly those that are carried on interstate transportation carriers). The State government is particularly concerned about noise problems that cross County boundaries and that cannot be solved by any one county. In addition, the State is also the licensing authority for boats, motor vehicles of all kinds and motorcycles. Consequently, the State has an obligation to place limitations upon noise levels where it is effecting human health and safety.

RELATIONSHIP TO GENERAL PLAN:

The Noise Element is a State mandated Element of the General Plan for every county and city. The Element is required to be adopted in Tulare County by March 20, 1975. A six month extension of time was previously approved by the State of California, CIR, so that the County and cities could carry out the necessary review of the Element. The Element meets all requirements of the adopted State guidelines as promulgated by the California Council of Intergovernmental Relations. It offers a variety of ways in which to mitigate noise hazards within communities and the environment as a whole. It relates specifically to transportation and to land use as well as structural standards, home appliances, and peculiar noise characteristics of human activity found in Tulare County as a result of the extensive agricultural operations that are carried on throughout the County.

THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION:

The Environmental Impact of the proposed action would be primarily beneficial to the County in that it would give scope and direction to areas of concern regarding noise problems. The cost of carrying out the program as suggested in the Element, involves an initial \$6,000 commitment for monitoring equipment plus related equipment which must be used to obtain accurate base data for writing a more complete and precise Element. Much of the data used in the Element is taken from secondary sources and interpretations of that data have been made in order to meet the requirements of the Element. Physical alterations of the environment will no doubt be required, particularly where funding for development by FHA or HUD is required. Walls, berms, acoustical treatment of structures, and other mitigating measures are necessary if noise is to be prevented. The impact will be felt upon the source of the noise itself, namely the person or device which is creating the noise, the path in which the noise is carried which could include for example, the construction of walls or tree plantings, and the point where noise is perceived, such as in homes, parks and schools. The receiving end of the noise may in many instances be the point at which mitigation must occur since the noise source may have already been pre-established and the new development going in will have to take measures to mitigate that noise at the property lines.

Essentially, the Noise Element is in itself a mitigating measure that, if properly carried out and executed, can minimize the dangers to human health, to the environment and to agriculture and urban development. For example, caution should be exercised in building in those parts of the County that are exposed to high levels of noise or that have the potential of being exposed to high levels of noise. The Element points out these areas of concern and more specifically points out those aspects of the environment that are man-made in character such as hospitals, schools, and passive park areas that need to be looked at carefully as they are developed or as development occurs around them so as to protect them from excessive levels of noise as defined in the Element. The monitoring program that is proposed in the Element must be designed in conjunction with the County Health Department and the firms that would supply the County with the necessary equipment to carry on monitoring of noise at critical points in the County.

An additional concern that is briefly mentioned in the Element and for which only a limited amount of reference material is available is the relationship of noise to animals. At the present time, there is not conclusive evidence that indicates noise as a factor in altering the productivity of domestic animals. However, available information does indicate that excessive levels of noise can alter the species composition and distribution of wildlife populations in a given area. The relationship of noise to domestic and wild animal populations is a matter of concern that warrants more thorough investigation, and more complete information on this subject will no doubt be available in the near future. The U. S. Environmental Protection Agency has begun to study this problem and has issued one bulletin on the effect of noise upon wildlife populations. The levels of noise that are being created in certain parts of the County are definitely impacting wildlife and their habitat. In conjunction with the Biological Resources Element of the Tulare County General Plan (as yet unadopted) the Transportation Plan being prepared for the County and the Land Use Plan of the County, the Noise Element provides an essential means of making decisions in conjunction with these elements when the question of noise is being considered. Essentially then, the environmental impact of the proposed action which is the adoption of a portion of a General Plan, could on balance, be considered to be positive.

ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED:

It is inevitable that some concern may be expressed by residents as a result of monitoring noise in and around communities since they may not be familiar with the requirements of State, Federal and Local laws. This may result in some people being concerned enough to write or telephone their supervisors or presenting opposition arguments to updating of the Element in the future.

Adverse environmental impact could occur when walls might be required adjacent to highways in order to mitigate noise problems. The aesthetics of wall berm and planting treatments adjacent to highways could be unattractive if not designed well or if inadequate maintenance is given to walls and plantings as they deteriorate over time. This kind of aesthetically unpleasing treatment can be seen in the Los Angeles County area where strong policies have been in effect for many years to protect highways. The tendency for property owners to discard rubbish and debris onto public rights of way where it is not visible to the property owners can create additional cost to government in street maintenance. The validity of wall treatments along highways in the Los Angeles Region is generally considered by planners to be worth the value of requiring the walls, particularly when access is restricted from lots backing up on highways primarily because of the safety

features of the idea. The fewer people that have access to major roads where access is not controlled, the less accidents are apt to occur. The adverse impact on the environment then, is offset by safety features and protection of very costly highway improvements. In addition, land used for mitigation of noise could remove land from productive use. A balance between cost and mitigation of adverse effects of noise would have to be sought.

The background levels of noise that presently exist in the County are relatively low since the County is primarily agricultural in character, the communities are small, and the manufacturing activity is concentrated in zones of industrial land. Aircraft flights in and out of the County are few in number so that the major problems that cannot be avoided are associated with the principal highway routes (U. S. 99 and others previously mentioned) that carry 5,000 or more vehicles per day. The absolute number of 5,000 vehicles per day is not of great concern providing that the percentage of truck traffic in that count is relatively low. If truck count traffic is high, then the noise levels will be considerably higher; the pitch, duration and frequency of noise will be considerably different than if the route were carrying only automobiles. In addition, the County is part of a statewide system of highways that traverse the entire State of California and the environmental effects which are associated with highway noise cannot entirely be avoided. Assuming that the population of California increases, or that tourist traffic increases, in an east west direction throughout the County, there would be no way to avoid noise except by altering the environment by building berms, walls, and other devices to obstruct the noise as it travels in a direct path and affects the land uses adjacent to highways.

Where difficulty will rise in the land use planning process is when land uses are placed adjacent to either existing or proposed high density corridors of traffic such as found along U. S. Route 99. Land uses such as mobilehome parks, motels, and the critical facilities such as hospitals, parks and resthomes must be carefully placed in order to avoid noise environments. Assuming that the land use allocation process is currently carried out as recommended in the Tulare County General Plan, Environmental Resources Management Element and the other Elements that have been prepared for use by the Planning Department, noise should be lessened. When the policies are violated then irreversible and adverse environmental effects may be created.

MITIGATION MEASURES PROPOSED TO MINIMIZE THE IMPACT:

The project in itself proposes mitigation of potential impacts on the environment both in terms of moving vehicles and stationary land uses. The information contained in the Element and the possible applications are such that human activities will be more likely to be distributed within the County in such a fashion that the noise hazards to humans and the environment will be lessened.

Initial cost of monitoring equipment could be reduced to \$6,000 by having analytical work done outside of the County system.

Numerous mitigation proposals to reduce or eliminate noise are contained in the Element. These include recommendations regarding purchase of appliances and home equipment, the construction of critical facilities and residential developments, the location of various industrial and transportation facilities, and placement of land uses. The proposed monitoring system and program are the backbone of the mitigation procedures that must be used if the County is to become a quieter place

in which to live, work and play. In some cases it is merely a question of maintaining the present background levels of noise so that they do not become excessive over a period of time. In order to do this, a monitoring system must be established or the Element will be less significant in its impact.

In order to mitigate adverse environmental impact of the aesthetics of highway treatment, the Element suggests alternatives such as building placement, other uses of land adjacent to highways rather than residential or critical facilities, dense plantings, limitations of truck traffic during critical times of the day, and limiting density or intensity of land uses adjacent to highways. In addition, the use of air conditioning and sound proofing of structures is required under various federal and state laws. Design of roadbeds can also be a mitigation measure where new pavement materials can be utilized. Litter laws are in existence and could be more strongly enforced where back up of lots on highways plus wall treatment is being proposed. Plantings in conjunction with walls and including adequate irrigation systems and plot plan review are other alternatives that would be most appropriate in urban areas.

Where land is being removed from productive use for mitigation purposes, it is possible to develop ways to marginally use such lands and thereby obtain (or retain) some economic returns. An example would be parking facilities, garages, storage uses or beautification of a commercial facility.

ALTERNATIVES TO THE PROPOSED ACTION:

The obvious alternative of no project would allow continued, uneducated exposure of man and his works to noise hazards. The County would have no basis for addressing the problem of noise in terms of County policy, the staff would have no basis for writing an Environmental Impact Report, staff studies, and general plan elements. Transportation and land use decisions would go on without the benefit of additional information that could be useful in decision making. This alternative is not feasible if only from the standpoint that there is a State mandate to prepare the Element and adopt it at the local government level.

The second alternative of course, would be to delay the project but this has already been done. The State has allowed the County additional time to adopt the Element and the County has utilized that time to prepare additional studies and inform as many people as possible about the Noise Element. This would have the same effect as having no project until such time as a decision was made to allow the project to go ahead.

The third alternative would be to allow the project which would offer the opportunity for planning to channel man's activities such as land use decisions and transportation decisions as well as building decisions in such a way that the potential noise hazards and problems could either be mitigated or eliminated. The environment would be safer and healthier for all concerned if the proposals in the project were carried forth.

The fourth alternative of course is to allow the project and then do nothing about it. This would involve adopting the Element but never carrying out the policies or reflecting the policies in day to day decisions of planning and building. This would have the same impact as no project.

There are numerous other ways to develop alternatives to the plan and programs proposed; however, these would be piecemeal and would be scattered about in various pieces of legislation and there would be no central place for recognizing the problem of noise in the environment, if the Element were not put together in the way that it has been done. A General Plan Element is a coordination device and can be used effectively if it pulls together fragmented pieces of policy already existing and puts them into a general plan framework. Citizens and other people interested in how decisions are made regarding noise can then find them easily and have ready access to necessary information. Decisions cannot be made without information and this is one of the reasons that Elements are prepared.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY:

In terms of the environment, there are cumulative effects that result from increasing background levels of noise as well as increasing point sources of noise. For example, the background noise level in and around a particular structure may average out at 45 or 50 decibels as measured in the A weighting scale, on a daily basis. An increase of 6 decibels would double the noise level. Therefore, it is important to have precise monitoring equipment in order to determine background levels in and around critical facilities throughout the County, as well as transportation routes and corridors.

The local short-term use of man's environment may mean that someone wishes to build a rest home in a specific location. The noise level is monitored and no impact is noted. The summer months come along and all of a sudden the noise level increases significantly. Meanwhile, the project has already been constructed and the long-term impact of the decision begins to appear. It may be that nearby industrial uses in the vicinity have to use roads or highways adjacent to the rest home. The industries may have been located there first but the noise level was never contemplated in terms of the long-term effects that would occur in relationship to the rest home. This is an example where conflict could occur between short versus long-term productivity or use of the environment. In essence then the Noise Element suggests that a long-range monitoring program be undertaken in order to offset problems associated with local short-term decisions made in regard to land use and transportation as well as critical facilities. In addition, traffic counts on major highways and roads throughout the County are aggregated in such a way within the Element to give at least preliminary indication of where the problem might exist. Once it can be ascertained that there is a general problem then the more specific problem can be isolated and worked upon.

The Element does not pose long-term risk to health or safety but on the contrary seems to mitigate such risks and hazards due to noise. There would obviously be some cost over a long-term period of time in mitigating noise. These costs are primarily in the maintaining of a data bank, providing staff support for the function, and providing initial equipment for monitoring noise levels in and out and throughout the County and for the cities on a contract basis if they wish to have it. In addition, the cost of fuel and automobile usage would increase. It also is estimated that initial cost of equipment for monitoring would be in the neighborhood of approximately \$6,000. Additional equipment such as a small programmable calculator, a unit for aggregating and collating data would be most beneficial and can be obtained at a cost of approximately \$10,000. These costs could be off-set somewhat by the County providing this service is on a contract basis to developers,

and other private and governmental agencies, as well as cities. On balance, the economic cost from the short range perspective are outweighed by the long-range benefits that can be given by the County in terms of service.

It is also true that the project is justified in that noise levels are increasing due to technology, greater number of automobiles, and urbanization taking place in the County. Noise hazards and problems do exist in portions of the County and the sooner planning commences to reduce or eliminate noise, then the sooner the limitation of such hazards can begin. This would then make the environment safer for people and their activities and create less consternation and concern on the part of citizens regarding problems associated with noise and safety from associated health hazards. The long-term productivity of man's environment would be enhanced by policies contained in the Element if implemented.

ANY IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED:

There would be irreversible environmental changes involved in the proposed action, but these would be positive as pointed out in the previous section. If the environment is left to be unplanned and no consideration is given to the problem of noise then the potential for increasing levels of noise and endangerment to human health would exist. It should be recognized, however, that there are limitations to the Element and the policies contained therein. Individuals have the right to create their own environments within their households, within their automobiles, and place they work in many cases, and the Element can only suggest ways in which to resolve the problem of noise if individuals wish to take action voluntarily. For this reason, the policies deal primarily with government actions that can be taken while some of the recommendations contained in the Element deal with action that can be taken by citizens to deal with the problem of noise themselves.

GROWTH INDUCING IMPACT OF THE PROPOSED ACTION:

Growth inducing aspects of the project would tend to occur when land uses were shifted from one place to another within the County or where transportation routes or corridors were shifted or altered in some way, or where government actions are taken with consideration of the Noise Element being of paramount importance.

As for increasing the population growth, this would be unlikely as a result of the adoption of a Noise Element. The implications of the Noise Element are if noise levels could be reduced particularly in cases where high density units are being proposed then it would make it more feasible to introduce higher density living units into the environment.

Whether or not this is a growth inducing impact is questionable since the developer could just as easily move a project to another location or mitigate the noise problem.

COORDINATION:

This Environmental Impact Report was prepared by the Tulare County Planning Department in accordance with the directives of the Tulare County Board of Supervisors.

FINAL STATEMENT:

Further statements from public and private agencies that have been and/or will be notified are to be attached upon the completion of this report. These statements, verbatim, will reflect the opinions of persons and agencies contacted in reference to this document. Responses to significant environmental points raised in the review and consultation process will be addressed in the form of an attachment to the FINAL Environmental Impact Report.

Respectfully submitted,

TULARE COUNTY PLANNING DEPARTMENT
Robert L. Wall, Planning Director


King Patrick Leonard, AIP, Division Head
Environmental Section

KPL:jm

APPROVED BY


ENVIRONMENTAL REVIEW COMMITTEE

11/20/75
DATE

45 days
REVIEW PERIOD

NOISE ELEMENT ENVIRONMENTAL IMPACT REPORT
SELECTED BIBLIOGRAPHY

(A complete bibliography for preparation
of the Noise Element is contained therein)

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- Tulare County Association of Governments, Draft Environmental Impact Report, Preliminary Transportation Plan for Tulare County, Quad Consultants, January 1975
- Tulare County Association of Governments, Five County Seismic Safety Element, Parts I & II, 1974
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- Tulare County Public Works Department, Traffic Volumes on County Roads 1971, 1972, 1973 and Revisions
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- U. S. Environmental Protection Agency, Effects of Noise on People, December 1971, NTID 300.7

APPENDIX H
OPINION OF COUNSEL

CALVIN E. BALDWIN
COUNTY COUNSEL

THOMAS D. BOWMAN
ASSISTANT COUNTY COUNSEL

COUNTY COUNSEL
OF THE
COUNTY OF TULARE

COURTHOUSE, ROOM 303
VISALIA, CALIFORNIA 93277
(209) 732-5511, EXT. 294

WALTER L. MCARTHUR
CLARK F. IDE
DENIS A. EYMIL
LITA O. BLATNER
ROBERT L. FELTS
DEPUTIES

July 9, 1974

Mr. King Leonard
Tulare County Planning Department
Courthouse, Room 107

Re: Noise Element of the
General Plan

Dear King:

You have asked us the following questions concerning the noise element of the General Plan:

1. What cases can you give us information on regarding noise and noise enforcement?
2. Do you have any suggestions regarding the noise element of the General Plan and what it should include from your perspective?
3. The Board has tried to come up with several "noise ordinances" in the past with no results-- can you give us information on these cases?

Your questions indicate that you are interested in general information concerning the noise element of the General Plan and the types of ordinances that the County might enact to control noise. Without having any specific proposal to review, I can only give you very general answers to your questions.

In answer to your first question, there are many cases on various kinds of noise laws. However, a detailed discussion of these cases is not particularly useful without a specific question or fact situation to relate them to.

There is an excellent annotation in 36 L Ed. 2d 1042 entitled "Validity, Under Federal Constitution, of Federal, State, or Local Antinoise Laws and Regulations," which collects most of the cases concerning the validity or invalidity of various noise control laws. Another excellent article on noise abatement appears in 7 USF Law Review at page 478 and is entitled "Noise Abatement at the Municipal Level." It also summarizes most of the cases pertaining to noise abatement.

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Generally speaking, a county may enact a noise control ordinance under its police powers. (Chavez v. Municipal Court (1967) 256 Cal. App. 2d 149.) However, certain kinds of noise control ordinances are invalid.

The primary reasons that particular noise control ordinances have been held invalid are the following: (1) the ordinance is unconstitutionally vague (see for example People v. James (1957) 6 Misc. 2d 441, 162 NYS 2d 927, in which an ordinance forbidding the operation of a motor vehicle equipped with a "Hollywood" muffler was held to be unconstitutionally vague); (2) the ordinance is an overbroad interference with the exercise of the constitutional right of free speech (see for example Phillips v. Darby (1969, DC Pa.) 305 F. Supp. 763, in which an ordinance absolutely prohibiting the use of sound trucks was held to be overbroad); and (3) the ordinance attempts to regulate noise in a field preempted by state or federal law (see for example Burbank v. Lockheed Air Terminal (1973) 411 US 624, 36 L. Ed. 2d 547, 93 Sup. Ct. 1854, in which a municipal ordinance forbidding jet aircraft from taking off from an airport between 11:00 p.m. of one day and 7:00 a.m. of the next was held invalid because the Federal Government has full control over aircraft noise, preempting State and local control under the State police power).

The problems of vagueness and overbroad interference with the right to free speech can be overcome by careful drafting and should not constitute any insurmountable obstacle to the enactment of effective noise control ordinances by the County.

A more serious problem in enacting a local ordinance is the question of Federal and State preemption of certain portions of the noise control field. Any proposed sound control ordinance will have to be compared with Federal and State law to see if there is a preemption or conflict problem.

Some of the areas where we might have problems under the Federal Law are those covered by the Federal Noise Control Act of 1972, 86 Stat. 1234 (42 U.S.C. §4901 et seq.). These include noise emission standards for new products distributed in commerce, aircraft noise standards, labelling requirements on products emitting noise capable of adversely affecting the public, development of low noise emission products for certification and purchase by the Federal Government, railroad noise emission standards, and motor carrier (truck) noise emission standards.

On the State level, it will be necessary to consider the effect of the Noise Control Act of 1973 (Health and Safety Code Section 39800 et seq.), the noise insulation standards

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adopted by the State Commission of Housing and Community Development pursuant to Section 17922.6 of the Health and Safety Code, the various provisions pertaining to motor vehicles and boats (see for example Harbors and Navigations Code Section 654 et seq. and Vehicle Code Sections 23130, 23130.5, 27150 et seq., 27502 and 27503) and the various provisions in the Streets and Highways Code governing the location of freeways (see for example Streets and Highways Code Sections 75.7 and 216) to see whether any proposed ordinance conflicts with State law.

In answer to your second question of what the noise element of the General Plan should include, Section 65302 of the Government Code sets out fairly well what must be included in the noise element. Subdivision (g) of Section 65302 sets forth the requirements for the noise element as follows:

"(g) A noise element in quantitative, numerical terms, showing contours of present and projected noise levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:

- (1) Highways and freeways,
- (2) Ground rapid transit systems,
- (3) Ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.

"These noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurrence. The recommended scale is sound level A, as measured with A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

"Noise contours shall be shown in minimum increments of five decibels and shall be continued down to 65 db(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 db(A).

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"Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the general plan."

"The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan, a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels."
(Emphasis added.)

The most important part of the noise element under Subdivision (g) are noise contour maps showing the contours of present and projected noise levels associated with all existing and proposed major transportation elements. The last paragraph of subdivision (g) requires state, local, and private agencies responsible for the construction or maintenance of transportation facilities to provide the County a statement of the present and projected noise levels of their facilities. The first step in preparing the noise element is, therefore, to obtain this information from the various transportation agencies and draw the noise contour maps.

After the noise contour maps are drawn, the only remaining requirement for the noise element under Section 65302(g) is that it contain "conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses."

I briefly discussed with Mr. Lowe of the Office of Noise Control in the State Department of Health, Berkeley, how other counties were coming along in preparing their noise elements. He says he is aware of only two counties that have prepared noise elements so far. He says that the County of San Diego has already completed a noise element and that he understands that Contra Costa County almost has theirs prepared. It might be helpful for you to obtain copies of the noise elements from these two counties and any other counties that have completed their noise element. Although their noise elements would undoubtedly not be suitable for use in Tulare County, at least they might give you some ideas on the general format of a noise element.

Mr. Lowe also suggested that some of the information necessary to prepare the noise contours may not be readily available from the various transportation agencies. He therefore suggested that we ask for an extension of time to complete our noise element. It is my understanding that such a request has already been made and hopefully will be approved.

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Turning to your third question, I am aware of only two ordinances that the County of Tulare has had in recent years relating to noise.

One County Ordinance pertained to the use of loudspeakers and was contained in former Sections 3330-3337 of the Ordinance Code which was repealed in 1973. This Ordinance was held to be invalid in the case of Chavez v. Municipal Court (1967) 256 Cal. App. 2d 149, because it required a permit to use a loudspeaker without adequate standards for determining when a permit should or should not be issued.

The other County Ordinance pertaining to noise is the present Ordinance which is contained in Sections 3340-3341 of the Ordinance Code. This Ordinance makes it unlawful for any person to willfully make, emit, or transmit any loud or raucous noise upon or from any public highway or public thoroughfare or from any aircraft of any kind. This kind of ordinance obviously is not terribly effective in reducing the overall noise level in the County.

As soon as you have your noise element in draft form, we will be happy to review it with you and discuss any problems in more detail. We will also be happy to discuss any specific questions you may have with respect to the noise element or noise control ordinances.

Very truly yours,

CALVIN E. BALDWIN
County Counsel

By Clark F. Ide
Clark F. Ide
Deputy County Counsel

CFI/rm

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